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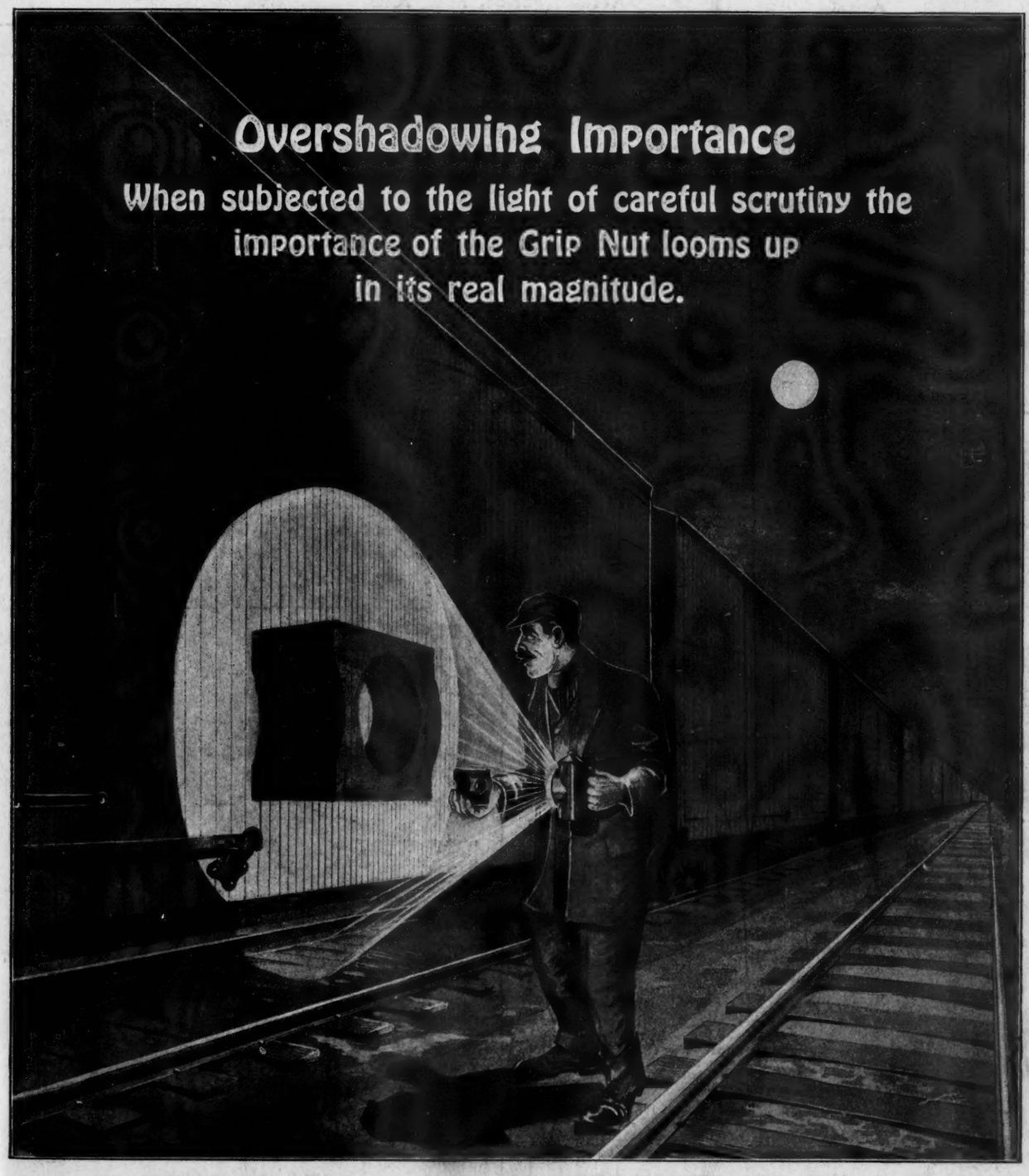
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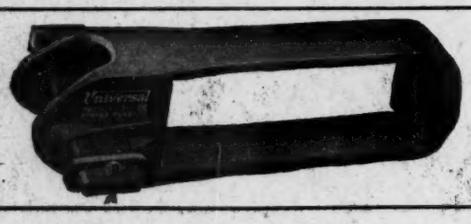

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Railway Age Gazette

Volume 60 February 18, 1916 No. 7

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Little has been heard for some time of the so-called unit system of organization which has been from time to time installed more or less extensively on different railroads. In some well-known cases the system has been either abandoned or considerably modified and it is probable that these changes were brought about largely by the type of men in the particular organization. It is not always possible to take the most available road master or assistant master mechanic and make of him a suitable assistant superintendent. In other cases, however, the system has worked out very satisfactorily, the most immediately noticeable results being the reduction in the amount of inter-department correspondence and its attendant red tape, and the freeing of the officers from routine office work for more important duties. Both of these results were among those claimed by the originators of the system. On the Canadian Pacific, where a modified form of the unit system is in quite extensive use, any casual observer can readily see the marked reduction in the amount of correspondence and other office work on the part of the officers while at the same time all correspondence is of necessity taken care of and signed by someone in authority who is qualified to pass on it. The officers are also brought into much more frequent and direct contact with the men, the result being that they are familiar with the characteristics and more particularly the failings of most of the men in train service and know just what must be guarded against in assigning certain men to any particular class of service. The extension of authority of mechanical and other officers over all of the men in train service has been found to assist materially in arriving at the best form of discipline, as investigations can be held at a time very close to the actual occurrence of an accident and the counsel, immediately obtainable, of a man trained in the mechanical department, shortens the proceedings and avoids the necessity of delays due to the correspondence being sent to another office for a master mechanic or some other officer to pass on. The unit system has been carried out on this road in a modified form to a considerable extent over the entire system and the results from its use during several years indicate that there is no likelihood of a return to former methods.

Success of Unit Organization Systems

The net surplus of freight cars reported by the Committee on Relations Between Railroads of the American Railway Association in its monthly statistical statement for February 1, was less than 22,000. The total surplus as of that date was 52,449 and the total shortage was 30,964. This is the smallest net surplus reported since the fall of 1913, when there was a net shortage, and represents a condition dangerously near that which was feared during November, 1915, after the net surplus had been reduced to 26,000. The December 1 report, however, showed an increase in the net surplus to about 47,000, and the situation was about the same on January 1. An increase of 7,000 in the shortage and a reduction of nearly 18,000 in the surplus during January, while influenced to a considerable extent by the congestion that still prevails in the east, and by adverse weather conditions, show that the heavy movement of traffic which has been breaking records for several months is still very much in evidence. The total shortage includes 22,209 box cars and 6,888 coal cars, while there were 12,793 sur-

Reduction in Surplus Freight Cars

plus box cars and 12,845 surplus coal cars. The report states that almost half of the box car surplus is in the southeast, there being very few idle box cars in any other section. The most important box car shortage is west of Chicago, in the grain territory, and the principal coal car shortage is in the east.

Government Railway Strike in Alaska

One of the main arguments that have been advanced for government ownership of railways in the United States is that it would be a sure preventive of labor troubles and strikes. Just how well-founded is this argument is illustrated by the fact that certain employees of the new railway being built by the United States government in Alaska have struck already. They didn't wait for the railway to be finished, they hardly waited for the construction of it to get well started, before quitting their work to enforce a demand for higher wages. The newspaper despatches say that the government was paying 37½ cents an hour for men employed in tracklaying gangs, while the employees demanded 50 cents for all common labor. "The section of the road upon which construction was halted," according to the newspaper report, "is the fifty-mile branch extending from Anchorage to the Matanuska coal fields. Approximately 35 miles of this line has been completed. A mass meeting at Anchorage, the principal construction camp, organized a federal labor union, with an enrolled membership of 600, and immediately issued a strike call." Sounds just like the U. S. A., under private ownership, doesn't it? We have official information that reports regarding the number of men who quit are exaggerated; but just the same there has been a strike. Curses upon these hard facts of actual daily human existence, which constantly arise to confute our finest theories! How can we prove that government ownership will remedy all our economic, social and political ills, when every time it is tried it bucks and refuses to remedy any of them?

A Dark Side of the Picture

December net revenue per mile for the 225,000 miles of railroad which have reported to date to the Interstate Commerce Commission amounted to $452, comparing with $263 per mile in December, 1914. According, however, to the compilation which has been made by the Wall Street Journal, there are now $844,500,000 railroad securities in default. This, of course, takes into account only interest-bearing securities and is in addition to the stock which is receiving no dividends. The next 12 months, if the present prospects are realized, will see the reorganization of a large number of the railroads now in receivers' hands, and unless the reorganizations are accompanied by a fairly heavy scaling down of fixed charges they will be the subject of criticism, and justly so. But while it is an indisputable fact that many of the roads now in the hands of receivers can only be put on a sound basis by an assessment of certain classes of security holders, either through a forced contribution of cash or an exchange of fixed interest bearing securities for stock or some form of security, return on which is contingent on earnings, this fact is poor consolation to the investor. The interest on the $844,500,000 railroad securities now in default amounts to in the neighborhood of $40,000,000 a year. This is the fact that looms large to the investor, and when in addition to the loss of interest already sustained the holder of these defaulted securities is asked to accept in whole or in part securities without a promise to pay a fixed rate, he may justly feel himself hard hit. If in addition there is to be a public sentiment against the payment of more than 6 or 7 per cent in dividends in prosperous times on railroad securities, the amount of money that will seek railroads as an investment will presumably not be on the increase.

Turn It Over to the Commission

Representative Moon again is trying to force through his bill to put railway mail pay on a "space" basis and give the postmaster-general almost autocratic power to fix the rates. The spokesman of the railways, the Committee on Railway Mail Pay, asks in an open letter to Congress, "Why not turn this complicated subject over to the branch of the government best fitted to deal with it wisely and fairly—the Interstate Commerce Commission?" How can there possibly be any answer except one to this question? The commission now regulates the interstate rates on every kind of traffic carried by the railways except mail. What fair ground can there conceivably be, then, for withholding from it the authority to fix the mail pay rates? Is it possible that mail is the only thing on earth reasonable rates for carrying which the commission is not able or fair enough to be trusted to determine? Can it rationally be assumed that it would be unjust to the government in determining this matter, while at the time it is assumed it will be just to railways, travelers and shippers in fixing other rates? The true explanation of the attitude of Mr. Moon and the postmaster-general manifestly is, not that they are afraid the commission would not be just, but that they are afraid it would be just. There could be no better evidence of the need for turning the mail pay question over to the commission than the stubborn opposition offered to this policy by Mr. Moon and the postmaster-general.

A New Form of Confiscation?

How far may regulating bodies go in requiring public service corporations in general, and railways in particular, to make enlargements of their plants and extensions of their lines involving the investment of large amounts of new capital? This question is directly and forcibly raised by the recent decision and order of the Railroad Commission of California in the case of Cabrillo Club et al. vs. the Atchison, Topeka & Santa Fe. The commission's order requires the Santa Fe to rebuild and restore to operation a line between Temecula and Fallbrook, Cal. This line was originally built and operated by the California Southern Railway. It ran through the Temecula Canyon and has been washed out twice by floods, in 1884 and in 1891. It was rebuilt the first time, but not the second time. In 1895 an attempt was made to get the Board of Railroad Commissioners of California to order the California Southern to rebuild, but it refused to do so. The property of the California Southern having been acquired by the Santa Fe in 1906, the reorganized railroad commission was petitioned for a similar order. The commission does not base its recent decision on the ground that the railway once provided a line there, and is obliged under its charter to continue to do so, but upon a provision of the Public Utilities Act passed only a few years ago. This provision authorizes the commission, after it is found upon hearing "that additions, extensions, repairs or improvements to, or changes in, the existing plant, equipment," etc., "of any public utility ought reasonably to be made, to promote the security or convenience of its employees or the public, or in any other way to secure adequate service," to require such additions or extensions. The chief engineer of the coast lines of the Santa Fe estimates that to rebuild the line through the Temecula Canyon would cost $657,000. He estimates that to build an alternative line which the commission prefers, would cost $823,000. The commission requires the railway either to rebuild the old line or to construct the alternative line, and holds that the law empowers it to do this. Perhaps the law does, but if so, is the law constitutional? If the commission

may order the Santa Fe to build a line costing $650,000, why may it not order it to build one costing $6,500,000 or $65,000,000? Needless to say, no fair return, or any return at all on the investment ordered to be made is guaranteed, although the road is given the gratuitous assurance of the commission that it thinks the line would pay. If commissions may so regulate railways as to cause investors to regard additional investment in them as undesirable, and may then turn around and order and compel the investors to make new investment, unquestionably the problem of regulation has been neatly and comprehensively solved. But such a proposition sounds a great deal like a definition of that tyranny which the bill of rights of the Constitution of the United States was intended to prevent. It is inconceivable that the management of the Santa Fe will ever obey the order unless the Supreme Court of the United States shall hold that it must do so.

TWO IMPORTANT PATENT DECISIONS

ON January 26 a decision was rendered by Judge A. B. Anderson, in the United States District Court, at Indianapolis adverse to the Bone patent on reinforced concrete retaining walls. On November 18 last, a similar decision was rendered by Judge R. E. Lewis, in the United States District Court, at Denver, relative to certain claims in seven patents on reinforced concrete construction issued to Daniel B. Luten. Taken together these decisions place a new aspect on the patent situation with reference to reinforced concrete which has long been a source of dissatisfaction to railway structural engineers.

The Luten patents have not resulted in any actual obstruction in the exercise of designing skill on railway structures because the holder of these patents has repeatedly declared that he did not object to the application of his inventions on work upon which he was not a bidder. The objections have arisen rather as a matter of principle, many engineers having expressed the conviction that the ideas covered were not patentable involving as they do the use of reinforcing in bridges, abutments and other structures in various common arrangements. The Denver decision, therefore, is of interest to railway men only because of the principles involved.

In the case of the Bone patent, interest is added from the fact that the Chicago, Burlington & Quincy and the Kansas City Terminal settled with the owners of the patent for sums aggregating in excess of $20,000. The patent covers the common use of reinforcement in a cantilever retaining wall, i. e., the placing of vertical rods in the back of the wall and extending into the footing and the use also of steel in the heel and toe projections. Singularly enough, the drawing accompanying the patent illustrates only an entirely special and distinctly impractical type of reinforcing. The patentee, however, has claimed that the patent covers the use of any type of reinforcement in the manner described.

Although different railroads have suffered inconvenience and expense as a result of these patents, the patent holders as a rule have directed most of their attention to the smaller concerns, and in consequence most patent suits have involved small municipalities, townships, etc. This condition has given rise to a contention which is borne out by the Denver decision, namely, that the defense in previous cases has not been adequately presented. In the Denver and Indianapolis cases the defense was assisted by leading authorities on reinforced concrete.

These cases have additional interest because of the fundamental principles laid down in the decisions. Judge Lewis declared that the placing of steel in positions to conform with certain mechanical principles, in the patents in suit, involved the application of mere mechanical skill, and that what had been done was in no sense the work of inventive genius. Judge Anderson gave as his opinion that the placing of reinforcing rods where tensile strain exists is not invention. If these decisions are to be appealed from it is to be hoped that early decisions will be reached because of the influence they will have not only on reinforced concrete construction, but on the general field of patents as well.

A DEMAND FOR THE INCREASE OF LARGE WAGES AT THE EXPENSE OF SMALL WAGES

A SEDULOUS effort is being put forth to make the public regard the controversy between the railways and their train service employees over the $100,000,000 a year increase in wages the latter are demanding as an ordinary struggle between capital and labor. It is being represented by the spokesmen of the labor brotherhoods and by a certain class of publications as involving merely an attempt on the part of railway employees to secure for themselves, in the form of reasonable advances in wages and shortening of hours, a part of the benefits of increased railway efficiency and earnings which otherwise would go to the stockholders in the form of profits.

This is a complete misrepresentation of the issues involved. The struggle is, directly, one between the railways and the train service employees who constitute less than 20 per cent of the total number of railway employees. But indirectly, and in a much more real sense, it is a struggle between the 20 per cent of railway employees who are the highest paid workingmen in America, and that 80 per cent of railway employees and of the public who are not as well paid. The statement that the other 80 per cent of railway employees are not as well paid as those in train service is only too easily demonstrable. The further statement that 80 per cent of the public is not as well paid is an estimate; but no man familiar with the incomes in general in this country will very strongly challenge it.

Why do we say the struggle is indirectly, but mainly, one between the train service employees, and the other 80 per cent of railway employees and the other people of the country? If the proposed increases in wages are made either they will not be, or they will be, offset by increases in rates. To the extent that they are not thus offset they will make it extremely difficult, or even impossible, for the railways for years to come to increase the wages of their other employees. To the extent that they are offset by increases in passenger and freight rates the consuming public will pay them. Who composes the consuming public? Is it made up entirely of capitalists and millionaires? It is composed of 100,000,000 people, most of whom are far from being millionaires. It is composed mainly of working people, farmers, small merchants, and salaried employees, and these are the people who ultimately must pay the bulk of any increases in rates which are made necessary by increases in railway wages.

Now, let us consider the comparative amounts of wages being paid to the train service employees, who number in the entire United States somewhat over 300,000, and to other railway employees, who are about four and a half times as numerous. The number of the first-named class, their total compensation and the average wages per employee in the fiscal year ended June 30, 1914, as shown by the statistics of the Interstate Commerce Commission, were as follows:

	Number	Total Compensation	Annual Average Per Employee
Engineers	61,365	$108,727,032	$1,771.80
Firemen	64,335	66,746,255	1,037.49
Conductors	47,621	73,032,660	1,533.62
Other Trainmen	135,853	139,005,561	1,023.26
Total	309,174	$387,511,508	$1,253.37

Compare the foregoing statistics with similar figures regarding the wages of general office clerks, station agents,

other station men and section foremen. The figures for the latter classes are as follows:

	Number	Total Compensation	Annual Average Per Employee
General office clerks	87,106	$75,429,665	$865.95
Station agents	39,147	31,841,367	813.38
Other station men	163,603	109,134,046	667.06
Section foremen	44,977	34,390,180	764.62
Total	334,833	$250,795,258	$749.13

There were 25,659 *more* of these employees than of those in train service; but they received $136,716,250 *less* in wages. The figures for general office clerks include those for all chief clerks. The figures for station agents include those for agents at the largest as well as at the smaller stations. It will be seen that the average station agent and the average section foreman *combined* earned only a little more than the average conductor, and almost $200 less than the average engineer. Each of them earned less than the average fireman or brakeman. These comparisons are not entirely fair, because station agents often receive some compensation from other sources, as from express companies, while section foremen usually are provided with houses. But if full allowance be made for all such factors, there still remains an extremely wide discrepancy between the wages of employees in train service and those of the other classes mentioned.

Besides the general officers and other officers, and the train service employees participating in the present wage movement, there were on June 30, 1914, a total of 1,381,413 other employees on the payrolls of the railways of the United States. How did the compensation of this entire number compare with that of the train service employees? The following table shows their numbers and what they were paid:

ALL EMPLOYEES EXCEPT GENERAL OFFICERS, OTHER OFFICERS AND ENGINEMEN AND TRAINMEN.

General office clerks	87,106	$75,429,665
Station agents	39,147	31,841,367
Other stationmen	163,603	109,134,046
Machinists	56,468	58,229,801
Carpenters	72,923	60,266,619
Other shopmen	256,133	191,359,706
Section foremen	44,977	34,390,180
Other trackmen	337,451	148,115,441
Switchtenders, crossing tenders and watchmen	37,873	22,917,957
Telegraph operators and despatchers	40,464	36,574,687
Empl. acct. floating equip.	13,019	9,495,128
All other empl. and laborers	232,249	168,211,260
Total	1,381,413	$945,965,857
Average		$684.78

From the foregoing figures it appears that the average annual wage of the employees who are now asking an increase of 25 per cent was $1,253, while that of the rest of the employees was only $685. The discrepancies in western territory were even greater. In the west the average engineer received $1,820 per year, while the average station agent received $850. The average conductor received $1,593, while the average section foreman received $750. The average wage of all train service employees was $1,296, while the average for all other employees was only $671.

Furthermore, the hours the train service employees work for a day's pay, and the number of days they work in a month do not average as much as those of station agents, other station men, section foremen and other employees. Practically no train service employee works more than 10 hours without overtime; thousands of them average less than eight, and even less than 6 or 4 hours, for a day's wage; and many of them earn their large pay while working only 20 to 25 days a month. The regular day of the section foreman is 10 hours, and he is subject to call every day, day or night, without compensation for overtime. His responsibilities are certainly as great as those of any train service employee, because he is charged with the duty of keeping the track in safe condition. The station agent also has long hours, and would any disinterested person familiar with the facts seriously contend that the amount of intelligence and energy required to perform the duties of a station agent are not as great as the amount required to perform the duties of an engineer or a conductor?

Wherein, then, is the justification for the wide discrepancies between the wages of employees in train service and other employees, such as clerks, station agents and section foremen? There is no justification for it. It is a result of labor unionism and of arbitration. Consider the absurdity of the average fireman and brakeman, serving as apprentices to the engineer and conductor, with no real responsibilities, and only manual labor to perform, being paid from 27 to 35 per cent more than the average station agent or section foreman! And one of the worst features of the situation is that the gap between the train service and other employees has for years been steadily widening. Between 1904 and 1914 the increases in the annual wages of train service employees varied from 35 per cent for engineers to 45 per cent for brakemen. The increase in the wages of clerks meantime, was 14.8 per cent; of station agents, 25.7 per cent; of other station men, 20.6 per cent; of section foremen, 27.5 per cent.

Do the foregoing facts and figures indicate that the train service employees have any just ground for complaint regarding their present compensation? On the contrary, on the average, they are receiving every cent to which they are entitled. There doubtless are some who are making too little; but there are others who are making too much in proportion to the value of their services to the railways or the public. Present conditions in transportation and in general business do not justify giving them a penny more in the aggregate. If the railways can afford to make any further advances in wages, it is time the train service employees were told to stand back and wait until some other classes of employees have received more consideration.

The *Railway Age Gazette* does not say that the railways should make general increases in the wages of all other employees, although it does believe there are some other classes that should be better paid. What it means to convey at present is that the tears which those who are so anxious to be philanthropic at the expense of others are shedding over the sad lot of the poor train service employees are worse than wasted. If they have tears to shed let them shed them for the 80 per cent of railway employees who are receiving an average of $685 a year, rather than over the 20 per cent who are receiving an average of $1,253 a year, or 83 per cent more. Let them shed them for that immense majority of the American people, in all the walks of life, whose average incomes approximate much more closely to the $685 a year of other railway employees than to the $1,253 a year of those in train service, and who are now in effect being asked by the labor brotherhoods, to pay higher freight and passenger rates in order that the poor conductors who are now receiving an average of only $1,533 a year may receive an average of approximately $1,920, and that the poor engineers who are now receiving an average of only $1,772 may receive an average of approximately $2,215!

And mind you, gentle reader, the wages mentioned above are not the *highest* received and asked by these poor, distressed employees, but the averages for all of them. Many thousands of them already are receiving amounts greatly exceeding the averages. How can the rich and generous American public refuse to be *touched* when the hat is passed for the benefit of that part of the suffering, necessitous conductors and engineers whose incomes are only $3,000 to $4,000 a year!

Letters to the Editor

REASONABLENESS OF THE TEN-HOUR WORK-DAY FOR TRAINMEN

ALBANY, N. Y.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Howard Elliott, president of the New York, New Haven & Hartford, in that part of his Washington speech printed on page 239 of your issue of February 11, presents one of the most refreshing bits of cold truth concerning the labor question that has been brought before the public for many a day. Everyone, he says, owes it to his country, as a duty, to give the best that is in him; and "in most kinds of work it is no strain for a healthy man to work ten hours a day."

And this fundamental truth applies nowhere more forcibly than in the freight train service. In the present discussion the men are, indeed, looking for money, not for a short day; but in the manifesto issued by their leaders last week (February 10) it is declared, as plainly as is safe, consistently with truth and with their real desires, that to rearrange matters so that they will work only eight hours a day is really their demand; and, therefore, they must meet the issue on that basis. The trainmen know that, with division engine-houses all arranged at towns convenient for ten-hour or twelve-hour runs, and many of the men's homes located on the same plan; and with other important elements making it very costly to shorten the mileage of the train runs, the companies cannot reasonably shorten the freight-train workday; but they have made the claim, and it is necessary to deal with it.

Before any board of reasonable arbitrators (this last manifesto repudiates the assistant leader who said that they would never arbitrate) the roads can have no difficulty in showing the reasonableness of ten-hour runs, looking at the matter from every one of the angles which have figured in previous arbitrations; and it is plainly their duty now to buttress their position with the additional point brought up by Mr. Elliott. This is the more important, as a principal element in the presentation of the trainmen's case to the public will be—or may be—the editorials of such demagogs as Hearst, declaring for the reasonableness of the eight hour day on general principles, ignoring the special conditions of the railroad service.

This reasonableness is based on the assumption that a man works with considerable intensity of application. In shop work one of the arguments for the eight hour day is that in it the men will do as much work as formerly was done in ten. The *Railway Age Gazette* has already shown how a large percentage of trainmen work only six hours a day, and often much less than that; but for the moment let us say that all work at least eight hours. What is the nature of the work? Ninety per cent of through freight conductors, speaking confidentially, to their friends, will say that they have an easy job. An average run takes 10, 12 or 14 hours. A *very large part* of this time is spent in resting, pure and simple. No; I will not put it quite so strong as that. The conductor must "watch out" at all times. He cannot go to sleep unless he has a good trainman to take his place as watchman. (This substituting is done every day in cases where conductors really have special need for rest.) But nine out of ten impartial arbitrators, if they could ride in freight cabooses every day for a month would confirm the declaration that the conductor has an easy job. They would do more than that; they would call it very easy. The brakemen have an equally soft snap. They have to do some flagging, and they have to endure severe weather at times; but this intensified portion of their duty is an exceedingly small portion of their whole work-day. It could be paid for at very high rates and would still leave the average pay, for the whole day, at a reasonable level.

The American human being seems to have an incurable propensity to magnify his own heroism; and to do this satisfactorily he has to make his burdens appear as big as possible. Everybody who is acquainted with conductors, brakemen, engineers and firemen, knows that these classes are not the most inconspicuous of Americans in this respect. By harping on the hardships and dangers of the trainman's life, one can succeed, after a time, in making himself believe that the job is worth $20 a day. But how tenaciously they stick to the jobs at the present rates!

A really ambitious man would be glad to do freight train work 12 hours a day at the present rates. If he had a family to which he was devoted, he would not want to do this seven days in every week, or for an indefinite number of years; but as to the actual strain of the work, on either mind or body, 12 hours a day is nothing remarkable. It is no harder than 10 hours—perhaps no harder than 8—in various kinds of work in which non-unionized men all the time are working long days, on piece work, with entire contentment. Indeed, it is a matter of common knowledge that trainmen all the time, right now, are, in innumerable instances, working as nearly as practicable to the limit of the 16-hour legal trainman's day, for the purpose of getting home to sleep; and with no serious complaint, so far as has appeared.

The essence of the reason in the trainmen's demands, insofar as they have any basis of reason, is that after an eight-hour turn, the work is more wearing, and is worth more cents per hour. It is the duty of the railroads to combat this view to the last ditch. It cannot be that the men demand an actual limitation of train runs to eight hours for any other reason than as a basis for parleying; for they know how it would break up a great majority of the present runs, and they know also that at the highest imaginable rates a large proportion of the men (not, as they say, a small number) would not be satisfied with what they could earn in eight hours out of 24.

A FRIEND OF THE TRAINMEN.

REDUCING DRAWBAR FAILURES

CHICAGO.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The pulling out of drawbars is a very serious matter, not only because of the delays to trains, but also by reason of the expense involved in repairing the equipment. To administer discipline for the responsibility of pulling out a drawbar is a most difficult thing to do intelligently, because of the fact that the train or crew which might happen to be handling the car when a drawbar is pulled out is not always directly responsible. It may be that the car had previously been handled roughly, its weakened condition resulting in final failure under the stress of ordinary usage.

At one time we had so many of these cases that they presented a very serious and very aggravating problem. When attempting to make an investigation the facts submitted by the employees involved would indicate that the car received no rough handling; nevertheless, the result was most apparent. This matter was given a great deal of thought, and a plan was developed whereby an exact record is kept of every drawbar pulled out. A bulletin is posted after the end of each month, showing the number of drawbars pulled out, classified by enginemen, the engineman pulling out the most drawbars heading the list, and so on. No criticism or special comment is made in the bulletin, and its text is about as follows:

The following is a list of drawbars pulled out during the month of....., 191..., classified by enginemen:

Mr. A.	4
Mr. B.	2
Mr. C.	1
Mr. D.	1

When an engineman makes an extremely poor showing in this respect, we then have the road foreman of engines ride with him and give him such instructions as he may deem

necessary. This method of dealing with the problem speaks well for itself as may be seen from the statement giving the situation by months since September, 1913:

STATEMENT OF DRAWBARS PULLED OUT PER MONTH

Month	Drawbars pulled out	Freight car miles loaded and empty	Number freight car miles per drawbar pulled out
September, 1913	57	1,420,392	24,919
October, 1913	54	1,890,554	35,010
November, 1913	31	1,697,640	54,762
December, 1913	20	1,281,277	64,063
January, 1914	18	1,341,677	74,537
February, 1914	18	1,320,674	73,371
March, 1914	15	1,855,560	123,704
April, 1914	10	787,404	78,740
May, 1914	9	1,001,169	111,241
June, 1914	9	1,151,606	127,946
July, 1914	16	1,252,565	78,285
August, 1914	15	1,365,418	91,027
September, 1914	11	1,474,418	134,038
October, 1914	17	1,331,419	78,318
November, 1914	16	1,201,102	75,068
December, 1914	17	1,357,032	79,237
January, 1915	17	1,490,877	82,826
February, 1915	9	1,172,665	130,296
March, 1915	7	1,274,520	182,074
April, 1915	4	1,176,431	294,107
May, 1915	4	953,639	258,410
June, 1915	5	978,594	195,719
July, 1915	2	1,021,840	510,920
August, 1915	5	748,126	149,625
September, 1915	3	1,155,926	385,309
October, 1915	10	1,503,416	150,342
November, 1915	10	1,430,789	143,079

G. E. HAIR.

WHO ARE THE ARISTOCRATS OF LABOR?

SYRACUSE, N. Y.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

More or less publicity has been given through the press to the announced intention of the railway engineers, firemen, conductors, and trainmen to demand an "eight-hour day" and more pay, although the latter item is somewhat hidden in the demand. These men desire to be paid the same for eight hours as for ten hours at the present time. In addition a higher rate is desired for overtime.

The comparison has been made between this class of railway employees and employees in the boot and shoe industries, the latter being classed as "aristocrats of labor." Now, in all fairness, why not compare the men of the brotherhoods with other employees of the railroads? The Interstate Commerce Commission reported in 1914 the average pay of engineers as $5.24 a day, of conductors as $4.47, of firemen as $3.22, and of trainmen as $3.09. Judging from the wages of various classes of labor in general, it would appear that these figures represent a fairly adequate compensation for the services performed.

For the sake of comparison the average pay is brought to terms of dollars per month as follows: Engineers, $157.20; conductors, $134.10; firemen, $96.60; trainmen, $92.70. Now consider the remuneration received by the various employees in other work. A trainmaster, who has supervision over the men in the brotherhoods, if in main line territory, may receive a trifle more than some of the men under him and again, if in branch line territory, may receive considerably less. A despatcher, who is directly responsible for train movements, would be more than pleased to draw an engineer's pay. An operator or signal man, upon whose care depends to a great extent the safety of train operation, would be far better off on payday if he had the word "fireman" written after his name on the payroll. Signal maintainers and track foremen who are skilled mechanics and upon whose work depends to a great extent the safety of the "limiteds" and the "specials" are worth to the railway, according to the payroll, about two-thirds as much as a fireman or a trainman; while the laborers, track patrolmen, etc., very efficient and trustworthy men, are rewarded for their efforts with less than half of a trainman's pay. Expert bridge and building foremen, who are skilled laborers, have to be content with the same pay as a fireman.

The railways have a considerable number of civil engineers in various departments, well educated, well trained and practical men. If one of these men is determined to stay with the railroad he must often be content to work hard and faithfully for from four to eight years before he is entitled to draw a fireman's pay. Roadmasters, or supervisors of buildings or bridges, each of whom may have the direct charge of the expenditure of from a third of a million to several millions of dollars of the company's money each year, and who may have the control of several hundreds of men, may just about break into the engineer's class in the pay car, but as often may be nearer the conductor's class. Their assistants and general foremen usually go below the rank of trainmen and firemen. Agents, office employees, baggage, and freight handlers and many other employees are usually paid far below the trainmen's rate while their work in many ways seems just as important.

A few of the unorganized men may know what an overtime allowance is but most of them do not. Pay for overtime for this class of employees is merely "the pleasure of the work." The regular working day is usually 10 hours with very often the opportunity of working overtime for "pleasure." It isn't very difficult to determine who are the "aristocrats of labor" on the railroad.

Possibly the brotherhood men deserve shorter hours and more pay; but in the face of comparisons it would appear that, service for service rendered, duty for duty performed, hour for hour at work and responsibility for responsibility that there are other railway employees who should be considered if there are any intentions of increasing the rates of pay.

ONE OF THE OTHERS.

MORE ABOUT THE TRAIN DESPATCHER

SALT LAKE CITY.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The article from Despatcher J. P. Finan, in your issue of August 27, page 380, certainly is a good one, and will be appreciated by many an old timer. It is very discouraging to find several notes behind the relay when going on duty. They are pretty sure to contain at least one unpleasant subject, and for some time after you have taken your transfer you have that subject in your mind. What kind of work can be expected of a despatcher on that trick? Such correspondence should be held back and taken up with the despatcher off duty. I know a good chief despatcher who never sent a note to a trick man. He was always there himself to see each of the shifts; and, as you passed by his desk, he "nailed" you and gave you the papers to read and make an answer right there; and that was all there was to it.

If the despatcher is constantly "roasted" he begins to feel that he is not wanted, and looks for another job. That is the beginning of many a "boomer." Officers are a great deal at fault for the boomer. Not only among despatchers but other employees; operators for instance. How seldom do you see an operator with a home. He does not know how long he is to be in that place. I know men who would buy homes and make gardens and raise chickens, but who are held back by harsh treatment from superiors. Can you picture right now in your mind a despatcher or an operator with a home of his own? I can't; and I have been in the business 30 years. I haven't any home either, just because of the conditions mentioned by Mr. Finan.

Going through the country some time ago I saw a dairy advertisement on a big bill board reading: "Milk from Contented Cows." It made me wish that I was one of them. You could secure better results from contented employees.

SPANISH RAILWAYS AND THE COAL SHORTAGE.—Railways in the south of Spain have petitioned the government to regulate the distribution of coal, the shortage of which has caused the price to go up to nearly $20 a ton. The crisis in the coal trade threatens soon to interrupt traffic and industry.

The Relation of Railroads to Foreign Trade*

Need for Different Policy of Port Development Railroads Vitally Interested and Willing to Co-Operate

By Fairfax Harrison
President, Southern Railway

Whether the relation of the American railroads to foreign trade after the European war is to be substantially different from that which it was before, and has been during the war depends upon substantial progress in the development of American policy with respect to export trade generally. The present limited question is then very little more or less than the general question to which this Foreign Trade Convention is addressing itself. To enable the railroads to be of the largest co-operative service in the development of foreign trade there must be progressive modifications of pre-existing practices in the relations of the railroads and the ports, some of which I shall endeavor to indicate as I see them.

The elemental function of a railroad—to facilitate the exchange of commodities between more or less widely separated communities—is not affected by the destination, whether it be domestic or foreign. In this respect the relation of our railroads to the commerce of the nation is not different now from what it has been in the past or relatively from what it may be in the future. But foreign commerce requires of a railroad more than its elemental function.

In the movement of all export commerce from the United States, except that carried by land into Canada and Mexico, there are three distinct units of service: first, the movement from the point of origin to the tidewater terminal; second, the handling from the cars either direct or through a storage warehouse to the ocean carrier; and, third, the ocean carriage to the foreign port. These units of transportation enter into the handling of import traffic in the reverse order. Of the three, inland transportation alone is the function of the railroad. The handling of goods at the port and their transfer to and from ocean vessels are entirely separate functions which may, and, in my judgment should, properly be performed by a separate agency.

Business Divided Between Too Many Ports

Generally speaking, in this country facilities at the ports for the interchange of export and import traffic have been provided by the railroads themselves. In numerous cases several railroads serving a single port have each provided independent waterfront terminals and railroads serving more than one port have provided separate facilities for each port served, thus involving large investments of capital for which there has been no adequate return because competition has to a considerable extent required the absorption of terminal costs as a practical deduction from the normal inland transportation charges, and, further, because the business is divided between too many ports and between too many separately owned and operated terminals.

Such conditions are economically unsound and must come to an end if economy of transportation is, in a national sense, to be a factor in the increase of the volume of our export and import traffic.

Let us hope that our foreign commerce may in time grow until there is real need of all the ports with which nature has blessed the long coast line of the United States, but in converting that hope into terms of actual life we may as well realize that a large number of insufficiently equipped ports is not as efficient a factor in the development of commerce at the stage we have now reached as would be a few sectionally representative ports, thoroughly well equipped. If this view shall obtain there is in prospect an increasingly fierce competition between individual ports for this position of sectional representation. On past experience we may expect the railroads to be in the vortex of this controversy. It may be settled by the survival of the fittest or it may be settled by the modern panacea for business ills, a statute; but in any event the best interests of our foreign trade will be in abeyance until it is settled. It is today a fashion to consider German practice in all considerations of efficiency. There may be more than an illustration of my point in the fact that the nation which has in recent years made the largest deliberate increase in its foreign commerce has concentrated on two well equipped ports. It is probable that in this respect Germany's transportation costs must have been benefited from the operation of the economic law that concentration of volume, short of congestion, reduces cost units.

The development of the seaports of the United States and especially that of the South Atlantic and Gulf ports, in relation to the railroads, has had its own peculiar history. Today, when in the matter of rail transportation the political theory of "equal opportunity for all, special privileges to none" is having full application, often in the teeth of the natural laws of trade; the rational explanation of the partial and incomplete development of some of our seaports is forgotten and the attempt is made to explain it by diabolical design. When the first railroads were built from the sea to the interior, they were comparatively small and always weak units. At the beginning they were economic monopolies and controlled all the traffic of a territory, insufficient though that may have been. As the railroad system was linked up and competition began between ports and between rival producing territories, the management of each local line which reached a port, actuated by the usual resource of the weak in dealing with a strong and impetuous force such as moves competitive commerce, exercised every effort of ingenuity to discriminate in transportation practices and charges in favor of its single port, thereby seeking desperately to maintain and to increase the volume of traffic of which it formerly had a monopoly. This was the only interest of the original seaboard rail lines; duty to the shippers of the entire United States was not yet considered; the golden rule was in abeyance so far as the early railroads were concerned. When it came to pass that rail transportation swallowed all other forms of inland transportation, as the lean kine swallowed the fat kine in Pharaoh's dream, and the shipper whatever his location no longer depended upon any single railroad or any single seaport, the franchises or what local philosophers still claim to be the absolute rights, of particular ports in respect of certain traffic were thus transmuted into competitive opportunities. It followed that discrimination in favor of the individual port has gradually been withdrawn by the railroad, not from any change of heart nor even from any lack of good-will, but as a consequence of economic pressure. This consequence of the development of transportation in a national sense seems to have proven an apparent atrophy to the commercial enterprise of some of the seaboard communities affected. They had come to depend altogether upon the railroad for their commercial pabulum: they had looked to the railroad to supply not only the transportation and the terminals, but the traffic as well, and when in time the discrimination in their favor was removed, partly by the working of an economic law and partly

*An address before the Third National Foreign Trade Convention at New Orleans, La., on January 28, 1916.

by the fixed and inne-lastic methods which have, in the past, been nationally characteristic of our public regulation of railroad practices, it has resulted that some seaport communities have exercised more energy in asserting claims to assumed natural rights and in prosecuting charges that the railroad has discriminated against them, with evil intent, than in adjusting, as the railroads have done, their practice to new economic conditions. Straight thinking on this question, in large terms, is necessary for that commercial health in which alone the opportunity of a seaport for foreign commerce may be realized. The ports which would keep up with the procession and become what President Wilson has called "masters of competitive supremacy," must do something in their own interest, apart from the railroads, or drop out of the race. If they act, rather than wait and bewail, they will find the railroads quick and eager to do their share. A man and a milch cow may technically speaking be a team, but popular usage interprets the term as two or more energetic units which pull together.

Requisites of a Successful Port

Export commerce will always seek the line of least resistance. It will go to the point where the service is best, storage facilities are most readily accessible and most of all where there are ships. To bring the ships the successful port seeks above all to develop its import traffic and its banking facilities. Next in importance, and here I come back directly to my subject, the port itself should provide terminal facilities for the exchange of tonnage between rail and water carriers. My own view is that the demands on the railroads in the future in respect of inland transportation are going to be at least equal to the rates which the public will allow for rail service, and that the seaport must hereafter look elsewhere than to the railroads to provide, or even to pay for the use of, water terminals.

Seaport communities desiring to participate in the benefits of foreign commerce and to obtain a competitive advantage over other available ports should then, I maintain, provide the necessary terminal facilities either through municipal ownership or through local terminal companies, and thus undertake the responsibility of supplying facilities without discrimination for all ships and all railroads reaching the port; and further they should impose charges upon the traffic, rather than upon the railroad, sufficient to make the terminal self-supporting. New Orleans has taken a step in this direction through its public ownership of docks and through the wise policy of the City Dock Board in undertaking to have uniform charges established for service performed at the city docks and at those provided by the railroads and terminal companies.

Railroads Will Do Their Part

When this point has been made clear as a principle of sound growth, it may be added that, while the obligations of a railroad as a common carrier are not different with respect to foreign commerce than with respect to domestic commerce, the policies of a railroad need not necessarily be limited altogether by its obligations. They never have been in the past and will not be in the future. The railroad, so long as it is a function of private endeavor, properly may and always will consider its interests as a business enterprise. Because prosperous communities along its lines bring increased traffic to the railroad, the alert management is vitally interested in the development of the territory which it serves and in helping the producers in that territory to find profitable markets either at home or abroad. As a large proportion of the products of the United States, either as raw materials or manufactured commodities, find, or, more strictly speaking, after domestic needs have been met, ought to find, markets in foreign countries, the carriage of these products to the seaports make up such a large part of the business of the railroads that they may properly so shape their policies as to encourage this business. This many railroads have done, and perhaps, as affects their own interest, have in the past overdone.

So long as we have a surplus of cotton, of coal, of grain and its products, and of lumber, with a vacuum of such articles in other parts of the world, the people who need those commodities will seek them here. We may not, however, assume that because foreign countries do buy of us that we have a natural and inexpugnable monopoly in supplying them, even when they are less fortunate than ourselves with respect even to those commodities of which we have a surplus. The facts "jump in our eyes," as the French say. Great Britain exports more coal than does the United States; Russia has a great surplus of wheat; Argentina, with constantly increasing areas of cultivation, finds a ready market for its surplus grain in those countries which also buy from us and which are eager to supply the needs of Argentina for every kind of manufacture which that country may require, including the manufactures of cotton. England is earnestly stimulating the growing of cotton in Egypt and in India. That competition with our cotton has as yet been negligible, but who will dare say what the future has in store when there is such a stimulus for success?

Prior to the war Germany exported cotton goods alone to the value of more than $110,000,000 annually, securing the raw material mainly in this country and selling manufactures thereof even at our own doors.

Therefore, with respect to any articles of commerce which may be obtained elsewhere, we must not only offer an article at least as good in quality, as attractive in other respects and at prices as low as those offered by our competitors in other countries, but we must also vigorously go after the business and in all respects meet the effort of our competitors.

Conditions After the War

The war has temporarily removed from the field of competition some of our strongest competitors for world trade. It has curtailed the ability of others to maintain the volume of their foreign trade and has, temporarily at least, increased our opportunity in the foreign field. Nevertheless the plain fact is, that aside from the sale of munitions and supplies to the belligerents themselves and despite the largest public discussion and advertisement of the subject during the past eighteen months, we cannot yet say that, in any large way, have we availed ourselves of the opportunity to increase a permanent and enduring trade with neutral countries. Whatever may be the explanation, the fact remains, we have not yet taken substantial advantage of an opportunity which diminishes every month as the war in Europe nears its term. It is an application of the old fable of the books of the Sibyl: we may expect to pay as much for half as might have sufficed to buy the whole.

This failure is doubtless due in good part to the fact that so much of our energy is employed in the production of the very large volume of business destined to the warring nations, but in that fact there is still ground for hope. With the cessation of the war this productive energy will be released, and it remains the duty of those who claim prevision of commercial opportunity to be looking to its employment in other directions. It should be the purpose of every patriotic American that a substantial part of that energy should be devoted to the manufacture and exportation of articles which may find markets abroad. Especially is this true for the reason that by developing a steady foreign trade we insure to our manufacturers a very present help in times of depression at home in the form of a constant revenue from sources unaffected by economic conditions which may temporarily diminish business profits in the United States. As a practical illustration of this which may come home to us here in the South, I may refer to the fact that when, on the outbreak of

the European war, the cotton market collapsed and business was profoundly depressed throughout the South, Chattanooga felt the depression relatively less than other southern cities because her manufacturers were then and ever since have been selling goods in the markets of every continent and of all the islands of the seven seas.

At the close of the war our merchants and manufacturers will find their European competitors in every field, not only endeavoring to get any new business that may offer, but also striving to wrest from American concerns the business they have developed during the war. It will be no ladylike competition, for we must face the fact that despite our philanthropies and our charities one of the results of this war will be to make the American business man not only a rival, but a hated rival, of all the nations now engaged in war.

The time, therefore, to work for permanent export business after the war is now,—not tomorrow morning, but tonight.

One of our strongest and most aggressive competitors in the future, as in the past, will be Germany. That country, where the fostering of foreign trade has been secondary only to the creation of the wonderful military machine of the Empire, has in comparatively recent years, made greater strides in the development of manufacturing industry and in the exportation of their products than has any other nation. This has been accomplished in no small measure by a system of governmental stimulus which threw wide open to foreign trade the government-owned railroads and terminals, which subsidized steamship lines and permitted the payment by manufacturing syndicates of premiums on exports.

It may not be amiss, as I am speaking primarily of transportation, to call attention to the fact that while the value of Germany's imports has exceeded the value of her exports, the tonnage was fairly balanced, and this, as every transportation man knows, is a very essential thing if the best results are to be obtained as to transportation costs. In this illustration there is, as I see the problem, one of the most important elements of a successful foreign trade. It is at the basis not only of practical economy, but of economic law. We may not, if we expect to be successful in our efforts to build up a world commerce, confine our efforts to exportation. We must furnish a market for the things which our customers have to sell, particularly raw materials, if we expect them to prefer our goods to those of our competitors.

Export Rates

Coming back again to the question of railway transportation, the German railways have given most effective aid in the development of that country's great export traffic. They have applied special rates on export traffic lower than on domestic traffic, and again special rates lower on export traffic to German ports than on that passing into or through other countries by rail. In their rates to German ports for export they make distinctions between traffic destined to different countries. That is to say, they make distinctions in their charges to meet the necessities of competition, differing in degree as to different territories of destination, just as the merchant must vary his profits to meet the varying competition found whenever he attempts to extend his trade beyond local boundaries. Our railroads in the United States must do these things if our people are to enter broadly into competition with other countries for a world-wide trade. And they are ready and willing to do so, if they do not thereby endanger the entire fabric of the domestic rates on which they must depend for bread and butter, if not for jam. To state this again practically and not theoretically, the railroads of the United States must be allowed to do these things without being charged with, and penalized for, discrimination against domestic traffic. Such a proposal requires a broad vision by regulating authority, but it has well rooted precedents. Even the Declaration of Independence does not claim more than that all men were *created* equal, and even Thomas Jefferson recognized that domestic commerce and foreign commerce were two separate and distinct functions governed by different laws, even when carried on by the same individual.

While there has been some just criticism in recent years of the rigidity of the export rates of American railroads in the face of suddenly developing requirements and opportunities, such as will always be characteristic of export trade, it has been generally recognized that that rigidity has been due largely to the process of adjustment of railroad practice to the steadily heavier hand of public regulation. In this process the indirect influences have been as potent as the direct; for while regulation has never attempted to prescribe a general relation between export and domestic rates the existence of low export rates has been a constant menace in attacks upon the reasonableness of domestic rates. Nevertheless when all is said on this subject it remains a fact that the railways of the United States have not been less effective than those of Germany or of any other country in regard to service or charges. We haul export grain 900 miles for 2.74 mills per ton per mile, and coal is carried to tidewater for less than 3 mills per ton per mile. Our rates generally on export traffic are cheaper, service considered, than are the rates of either the German or English railways. It can never be fairly said that in the past the railroads of the United States have failed to do their part in the development of the export traffic which the United States has heretofore produced.

With this claim it may be admitted that looking ahead and not behind, changes of methods on the part of the railroads as on the part of our manufacturers may be necessary to give the largest effect to our present opportunity for a really great foreign trade. At the moment what seems most necessary is a full understanding of what is required of all concerned to meet national competition as we shall find it. It is a demand that we shall think in larger terms than has been our wont. The preparation of that understanding is now going on, too slowly it seems to some who have vision to see the goal, but still it is going on. Great strides have been made in the last year, and many new, and with us unprecedented, things have been done. The National Foreign Trade Council has been a large factor in this patriotic stimulus of progress. Some of the railways also have done some of these things, but speaking of the problem as a whole, and of the railways as a part of it, it may be said that the railways are managed by men who are alert to change their methods when advantage of change is even darkly hinted; and that they may be expected to do their part in whatever is really necessary.

Nor is there any reason to assume that regulating authority can not or will not agree that the railroads may do whatever is shown to be sound and best for the nation as a whole, for have we not witnessed the spectacle of a political body revealing at once vision and courage by agreeing, in the face of a deep-rooted selfishness and a clamor of popular prejudice, to advances in domestic railroad rates which have been proven to be necessary if our railroads are to continue to be true commercial arteries. If regulating authority shall take the broad view of the relation of the American railroads to foreign trade which has been demonstrated to be successful in other lands, and those who by actual experience are expert in foreign trade shall indicate, frankly and without too much individual selfishness, the requirements of each situation as it shall arise, I venture to say that the railways of this country may be relied upon to do their utmost, perhaps more than their rightful share, in co-operative effort to take full advantage of our immediate national opportunity.

It has already been demonstrated that the railroads may aid effectively in the development of foreign commerce by co-operation with the producing communities and the seaports which they serve. It is not only impracticable, but it would manifestly be improper, for a railroad to act as a selling agency in foreign markets for individual merchants and manufacturers, as has been ingeniously proposed by some; but

the railroad may properly gather and make available to all shippers in a position to use its facilities information as to foreign markets, as to customs laws and port regulations, as to methods of packing and shipping and as to all other matters that may be helpful in building up export business. It may, with equal propriety, advise merchants in other countries where and from whom in the territory served by it they may buy such commodities as they want. It is service such as this that Southern Railway Company and the companies associated with it have undertaken to perform with respect to trade with the countries of South and Central America and, to some extent, with other foreign countries, through their South American agency, through foreign freight agents at New Orleans and Mobile, and through freight traffic agents at other seaports. I am glad to be able to report that this special service is now beginning to show real results and to justify the experiment.

COUNTRY-WIDE INVESTIGATIONS

Washington, Feb. 17, 1916.

The Senate on Tuesday went on record, by a vote of 39 to 22, in favor of a general congressional inquiry into railway conditions as proposed by Senator Newlands, following President Wilson's suggestion to that effect, and went a step further by adopting an amendment introduced by Senator Borah to broaden the inquiry to include:

"Also the subject of government ownership of all public utilities, such as telegraph, telephone, express companies and railroads engaged in interstate and foreign commerce; and report as to the wisdom or feasibility of government ownership of such utilities and as to the comparative worth and efficiency of government regulation and control as compared with government ownership and operation."

The resolution of the United States Chamber of Commerce, referred to in the *Railway Age Gazette* last week, calling for an investigation of the railway labor question is, in full, as follows:

"Whereas, It has come to the attention of the Chamber of Commerce of the United States of America that grave differences are impending between the railroads and certain of their employees which, if not adjusted may result in serious interruption to transportation, and,

"Whereas, Such an interruption of the traffic operations of the United States would be a national calamity and—if arising through arbitrary action on either side without the questions in dispute being submitted to a careful and impartial analysis—would constitute an act inimical to public welfare fraught with grave consequences, be it, therefore,

"Resolved, That it is the sense of the Chamber of Commerce of the United States of America that the parties to the controversy should and in the interest of the public weal must settle their differences without recourse to measures that would impair the public service; and be it further

"Resolved, That the Board of Directors of the Chamber of Commerce of the United States appoint a committee which shall carefully and impartially investigate and consider such phases of this critical situation as relate to the interests of commerce and the public and shall from time to time report to the Board of Directors as to the best means of preserving the public service unimpaired."

Representative Sims of Tennessee has introduced in the House a bill, No. 10485, which embodies the various safety appliance proposals embraced in the bill introduced in the last Congress by Mr. Stevens of New Hampshire; a blanket bill, putting all these matters in the hands of the Interstate Commerce Commission. Mr. Sims includes the compulsory introduction of the block system; investigation and conditional compulsion in regard to automatic train stops; steel cars, compulsory after ten years; locomotive headlights conditionally compulsory after two years, and general supervisory authority, on the part of the commission, in regard to the efficiency of roadbeds, equipment and structures.

THE NIGHT CHIEF DESPATCHER

By J. L. Coss

Many superintendents and other officers seem to attach very little importance to the position of night chief despatcher. The transportation question at night requires just as much supervision as in the day time, if not more. The reasons for this are known to the average operating officer. This being the case, the night chief should have a free hand to meet the requirements of his position. In many offices his time is nearly all taken up in making reports. This necessitates spending hours over the desk and rummaging through old files in order to get his reports out by 7 a. m. If there are any old records to be looked up in connection with claims, the night chief, when he comes to work, generally finds a few notes on his desk bearing the familiar "Please note and dig up the necessary tonight."

All such work as this could be accomplished by a sixty-five-dollar clerk, and thereby give the night chief time to devote to transportation problems. If he is successful in saving the payment of an hour's overtime to a train and engine crew each night he has more than paid the salary of the clerk. He cannot spend all night over a desk and still look after the movement of engines and cars and have much success in making a showing in that direction.

There is too much disposition on the part of the day force, both in the superintendent's and the chief despatcher's office, to assume that because the night chief is on duty 12 hours he has the time to do the cleaning up. If he is required and expected to do this kind of work, it is not reasonable that the superintendent should hold him responsible for any irregularities in the management of the division. To successfully operate a division, while most of his superiors are asleep, a man must be able to keep in close touch with the trick despatchers, the yardmasters and the roundhouse foremen, and the performance of the men on the road, so that when a proposition arises requiring an immediate decision he can give it right on the spot, without having to stop to investigate the whole thing and then, probably, act wrong because of lack of knowledge of the prior details. If the business of a division warrants the supervision of a night chief despatcher his time should be spent entirely in that direction. Of course, if it only requires a report man a neat and up-to-date compilation of the reports is all that can be expected—even though you christen him "night chief."

NEW RAILWAY TO ATHENS.—In consequence of stringent orders from Athens that the extension of the Larissa Railway to Verria shall be completed and opened for traffic by the end of February, extra gangs of laborers have been set to work on the line.

EARLY RAILWAY MAIL CARS.—The Springfield (Mass.) Republican prints a letter which goes to show that a post office distributing car, evidently with a mail clerk in attendance, was in use on the line between Boston and Albany, through Springfield, as early as 1852; an item of history tending to discredit the generally accepted statements, made by various writers, to the effect that the first cars used by the postoffice department for distributing letters were those which were fitted up about 1864, when Colonel G. B. Armstrong was the superintendent of railway mail service. The evidence now presented is in the shape of a letter (folded on itself—no envelope) which was mailed on a train in 1852, bearing the post mark "Boston & Albany." The writer calls attention to the fact that former Post Master General Thomas L. James, writing in "The American Railway" (published by Scribners in 1899), gives the credit for the first distributing car to W. A. Davis, who was instrumental in having such a car put on the route between Quincy, Ill., and St. Joseph, Mo., in 1862. Mr. James says, moreover, that the idea came from Canada and that the Canadians got it from England.

Railroad Supply Cities Feeding the Firing Line

How the Immense Central and Distributing Stations Assemble and Forward Material for the French Army

By Walter S. Hiatt
Our Special European Correspondent.

As much science is employed in putting food into a soldier's mouth as in putting bullets into his opponent's skin. There is more method in supplying food to cavalry and wagon horses, gasolene to army automobiles, shells to cannon, medical supplies to hospitals or material to the engineering corps, than there is madness in the war itself.

The task of carrying supplies to an army of 4,000,000 men, concentrated, as in France, on a line 600 miles long by 20 deep is one of the most complicated of the war. It does not begin to give a conception of the vast transportation problems involved to say that daily 25,000 tons of rations must be forwarded to the soldiers, that 1,000,000 quarts—a veritable river—of wine must reach them, that 75 tons of lead must be shipped for each German killed or

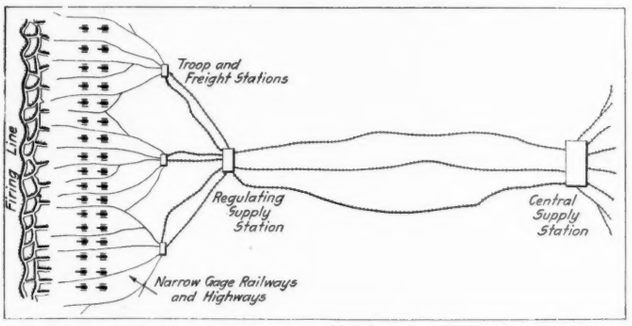


Diagram Showing Relative Location of Supply Stations

wounded, or that the cost of war material forwarded each day is $10,000,000. One railroad alone furnishes more than 3,500 cars a day for army transportation purposes; 100,000 automobiles and 600,000 wagons are required to distribute the shipments at the front.

When I received an invitation from one of the members of the general staff of the Fourth Bureau of the War Department (the bureau in charge of railroad transportation) to visit one of the great storehouses which assembles and redistributes supplies for the front, I accepted the invitation gladly. I expected, nevertheless, to meet only with the prosaic freight details that may be seen at any big railway center. It seemed like studying over again the machinery of supplying some big city of civilians.

My attitude was much like that of a civilian official in charge of the supplying of artillery for the front. Officers at the front kept calling so insistently for more and more cannon, that finally one day last summer he made a trip to discover why the steel plants were not turning them out fast enough, by the thousands, just like so many pins, instead of a few a month. When he reached a certain plant, he was shown a huge block of steel about the size of a small railway station. "What is that for?" he asked. "Why, that's the beginning of a 420 mm. cannon," answered the proud manufacturer. "Oh, but I never thought it took so much steel as that," said the civilian. A little further along he saw another block of steel with a hole punched in it. "And what is that?" he asked. "That's the second stage of the cannon," was the reply. "Oh, oh, oh!" exclaimed the civilian, eyes bulging, "I never knew you had to punch holes like that." When he quit the plant he was quite satisfied that the business of making cannon took lots of time.

As the staff officer and I rode out in an army automobile toward the central distributing plant, I ventured to express myself. He smiled and handed me a 200-page book, printed in small type, containing the old army regulations for handling commissary supplies. "That's but one branch of the subject," he said, "and there's a whole library filled with books on it. However, this war has put them all out of date."

For a while just after the war began the immense armies and the problems resulting therefrom compelled the officers to resort to methods established 250 years ago by Louvois, minister of Louis XIV, at a time when armies had hardly ceased being mere mobs of men, living from hand to mouth, and destroying or stealing for what each individual could make out of it. For a time they followed the methods of Napoleon, quartering soldiers on civilians, making levies on cities for supplies, or in short, living on the country where they happened to be.

It is true that there were before the war ten railway centers for as many army warehouses, containing reserve supplies. These were distributed in different parts of France so that as many different sections of the country as possible could be drawn upon without disturbing, in theory, the source of supply abnormally. There were also 91 bread

Unloading Supplies at the Supply Station

factories, 58 parks for grazing livestock, and 32 concentration storehouses, containing in all 767,000,000 rations.

The war has broadened this system quite considerably. Now, all supplies whether obtained by the commissary department or other departments of the minister of war, or by requisition commissions in the French colonies or in any of the 78 uninvaded departments of France are directed to some 20 *stations-magasins.* These are situated about 50 or 100 miles from the front at points where there are extensive freight yards. They in turn send supplies by railway to the *gares regulatrice* (regulating stations) whence after the cars are classified, they are sent on to the *gares de ravitaillement,* possibly from 5 to 15 miles from the front. Supplies are carried from there on in army wagons, automobile trucks, or on narrow gage railways over which the cars are moved by noiseless Decauville engines.

The *stations magasins* or central supply stations are, of

course, at strategic points reached with facility from important seaports and other cities. They are divided into four sections, one for the commissary, one for the artillery, one for the engineering corps and the fourth for the hospital service. Each of the score of stations is required to forward daily supplies for a certain number of men, possibly 50,000 or 100,000 and in some cases more. To be on the safe side, and for fear of possible freight congestion, the *gares de ravitaillement* have on hand supplies sufficient for 10 days.

The commissaire militaire at the *station magasin* has to forward daily from one to three trains of supplies (40 cars usually being necessary to supply an army corps for one day) to each *gare regulatrice*. The officer in charge of the latter classifies the cars and forwards them to the *gares de ravitaillement*, the location of which varies according to the movements of the army and at this point, as noted above, the supplies are unloaded and held until forwarded to the firing line.

The most important if not the most picturesque of the various centers is the *station-magasin*. The regulating stations merely classify cars and pass them on while at the last stations the quantity of supplies discharged at any one point is relatively small, though the operation may be done to the tune of enemy artillery shells or aeroplane bombs.

Arrived at the railway depot of X, in peace times an important railway center, we were met by the Commandant who is the *commissaire militaire* both of the depot and the *station-magasin*. In explaining the function of the *station-magasin*, he compared it to a reservoir at a mountain base, receiving the water as it came helter-skelter down the mountain and guiding it in a regular stream to the insatiable desert beyond.

By way of putting his visitor at ease, the Commandant remarked laughingly: "The *station-magasin* I am going to show you merely represents what we do. We have here in the surrounding country hundreds of head of sheep and cattle and a veritable little Chicago stock yards for slaughtering our pigs and hogs, making them up into sausages and other

Loading Bread Into Cars at the Central Supply Station

meats for the soldiers. This slaughter house is none other than the Chateau L—, once the French country house of King Leopold, of Belgium."

"I hope you don't confuse cats and dogs with your hogs," I suggested, "as our American slaughter houses were once accused of doing."

"No, but we ship your canned meats to the soldiers just the same. They call the tins 'boxes of monkeys.'"

In company with the Commissaire Militaire, Commandant D—, and Colonel M—, of the Intendance, we visited the transportation city. The latter has a personnel of 1,800 soldiers, made up of railroad men, bakers, carpenters, men of the engineering corps, etc.

As Colonel M— told the story of the city which he had built, I was reminded of the Western cities that used to grow up overnight around railroad terminals out of the trampled grass of the prairie. The colonel explained that he had been assigned to his work May 10 last, when the growing size of the armies put in the field made it impossible for the ten original supply stations to handle the job. "When I came here," he said, "I was given a field of oats and ordered to begin supplying 100,000 men every day, with instructions to take over later a few side-lines like feeding 35,000 horses, etc. Our first 100,000 rations went forward June 18, and we have not missed a day since. My tracks and other facilities cost but $100,000."

How had the work been done? I looked in vain for the oat field. The space he indicated with a sweep of his hand,

A Station-Magasin or Railway Supply City

possibly 30 acres, adjoining the permanent yards of the Orleans railway, was covered over with tracks and buildings, some 40 in number. The buildings were erected after the solid French fashion, covered with red tiled roofs, fit to stand for a quarter of a century. On their outer fringe stood the semi-temporary quarters of the soldiers.

It is truly said that wherever the French go, they build everlasting roads. As we went towards the city, we traveled over a graveled road, newly made, on which the soldiers were still working, laying solid stone foundations against the mud and rain of winter. When the war is over the farmer who owns that oat field will have his work cut out for him tearing up that road.

As we walked into the city with its streets, its population of busy soldier workers, in their sky-blue uniforms, the Colonel pointed out his water hydrants and told how he drained the rain into a large central cistern from which he could obtain a sufficient supply of water in case of fire set by some spy, an aeroplane bomb or by a locomotive spark.

The pride of the city seemed to me to be the wonderful bakeries whose products are loaded into dozens of straw-lined cars each afternoon and sent to the front. These bakeries turn American flour into the sweet-smelling three-pound loaves of bread that really form the staff of life of the French soldier. That is why the bread train is the one he waits for most patiently, and expectantly. There are in all 24 buildings devoted to making bread, divided into three series of eight each, one series for the storing of the flour, a second for the baking of the bread, and a third for storing it previous to loading.

A curious detail of the bakeries lies in the fact that the heat is derived from wood burned in a slow, smothered fire, so that some charcoal is obtained, a ton a day, and this charcoal shipped to the cooks in the trenches. In order to get this invaluable smokeless fuel, the locomotives at the front also occasionally burn wood and manufacture charcoal for the trench cooks.

An interesting detail of the transport city was the method of shipping the wine to the front. It is received in special

tank cars, not unlike an American oil tank car, run into small barrels of 200 litres each, and these reshipped in freight cars. The coffee, too, is received here in bulk, roasted in a building built for that purpose, and then reshipped in small sack lots. "We really run a sort of wholesale grocery," remarked the Colonel.

There are 8 tracks, each 1,600 feet in length, laid to care for the trains that are made up daily. Bulky supplies, hay for the horses, bread for the men, shells for the cannon, whatnot, are carefully put into the same car, while the small groceries, the *petits vivres,* the meats, coffee, sugar, tobacco, salt, pipes, cheese, are put together perhaps in the same car. This distribution is made to prevent confusion in deliveries and disputes as to quantities.

When the cars are duly labelled, bills of lading made for their contents, the train made up, soldiers and officers from the various departments represented board the train, and it pulls out to the main track with the right of way.

When it reaches the *gare regulatrice,* where dozens of other such trains are centering, the trains are ordered to such and such a destination, perhaps first broken up and part of their load sent one way, part another, according to the needs of the day.

As a train from the *gare regulatrice* reaches the third and last stage of its journey, it drops off a car of supplies here, another there, as the orders run. If a battle is raging at the front, the engineer may receive orders to wait until night before venturing along the danger zone, or, if the need is pressing, he may brave the shells and proceed.

BOSTON & MAINE

The following is an abstract of the majority report of the board of directors of the Boston & Maine to the stockholders, proposing the absorption of subsidiary lines:

It is unnecessary for us to inform you that the financial position of this company has been for the last several years, and still is, extremely precarious. However gratifying the improved earnings of the company may be they fail to relieve the situation because the chief cause of this condition lies in the character of its financial structure.

The capital stock of your company amounts to $43,000,000 —and upon this foundation have been placed obligations as follows:

Boston & Maine bonds	$43,000,000
Boston & Maine floating debt	13,500,000
Bonds of Leased Lines	44,000,000
Floating debt of Leased Lines	5,500,000
Capital Stock of Leased Lines (on which the dividends are a fixed charge on the Boston & Maine)	52,500,000
Total	$158,500,000

equal, in all to nearly four times the amount of your capital stock.

From the point of view of earnings, the fixed charges of the Boston & Maine (represented by interest and rentals) for the year ended June 30, 1915, were over $8,600,000 as against net earnings during that year (applicable to the same) of about $8,300,000.

The net result of the operation of the system for the six months period ending December 31, 1915, shows a surplus after charges of $2,227,960. This was caused partly by exceptional business conditions and partly because many improvements (chargeable to operating expense in part) which otherwise would have been made were deferred by reason of the uncertainties of our financial future. For the fifteen years period (since the Fitchburg Railroad was leased), the net earnings beyond fixed charges have averaged less than $1,250,000 per annum. There are few, if any, roads of recognized credit whose average surplus beyond fixed charges over a period of years has not been equal to, or in excess of 75 per cent of the same. This road is not in that position. Its credit has been destroyed by the results of the last three years, which have so exposed the unsoundness of its financial structure that no improvement in earnings can hide it.

The following is an abstract of the recommendations of the board to the stockholders:

Some or all of the leased or operated lines be acquired by purchase or consolidation through the issue of first preferred stock of the purchasing road, payment to be made at par for par value of the purchased road's stock now outstanding, with dividends at the rate now paid on that stock.

Dividends are to be non-cumulative for three years and after that period cumulative.

New money shall be furnished by the stockholders of the present Boston & Maine by subscribing for new preferred stock at par not to exceed $40 per share of the present outstanding stock.

That the amount of cash shall be such as can be underwritten by giving to stockholders the alternative of (1) subscribing to new stock as above; or (2) retaining the present stock and paying an assessment of $5 in lieu of subscribing for new preferred stock; or (3) surrendering one-fifth of the present holding of stock in lieu of subscribing for new preferred stock or paying a cash assessment.

The underwriting agreement is to provide an opportunity for stockholders to borrow for one year at 6 per cent enough cash to subscribe to new preferred stock.

Dissenting Opinion of Judge Knowlton

I regret that I cannot agree with the majority of the committee in their report. The proposition must be treated either as a contemplated arrangement to be made with two corporations with whose representatives negotiations have been had, or as an arrangement to be made, if possible, with all the corporations belonging to the Boston & Maine system. As everybody agrees that it is of great importance to maintain, if possible, the integrity of the present system, I understand that the plan is to include all the corporations belonging to the system, or so many of them as will consent to adopt it.

Many of these corporations are operated by the Boston & Maine railroad under leases made many years ago at rentals when the earnings of railroads were very large, and when the limitations and restrictions and burdens put upon railroads in recent years did not exist. These rentals range from 10 per cent dividends on the capital stock, with a large sum for maintaining the organization of the corporation, and with other privileges, down through various percentages to some that are comparatively small. These rentals are much larger than can be earned by most, if not all, of the several railroads under existing conditions. Many of the leases run for nearly 100 years from their inception. For this reason and for other reasons the trustees and other managing officers of the Boston & Maine railroad have felt, and have repeatedly said on public occasions, that the corporation could not go on without a voluntary reorganization that would diminish its fixed charges, or without the appointment of a receiver.

In reference to the duty and ability to meet its obligations, the corporation is insolvent today. The corporation, as a corporation, cannot go on and perform its public duties and pay these rentals. The stockholders as individuals are under no obligation, legal or moral, to assume or carry out the contracts of the corporation. The lessors are interested in the corporation, because they have contracts with it. The stockholders are interested in the corporation, because they paid in its capital in the expectation and with an implied understanding that it would earn dividends. Inasmuch as the corporation itself cannot go on without a new arrangement, these parties are alike interested to unite in concessions and contributions that will be mutually advantageous. Their interest is alike, and their duty to the public, so far as there is such a duty, rests upon both parties.

The plan proposed in the report requires the stockholders to make contributions either in the way of taking and paying for preferred stock or making a direct money contribution,

or by giving up a quarter of their stock. It leaves all the leased lines to receive their present rentals without diminution, if they are earned, before the common stockholders can receive anything. This seems to me to be putting all of the burden upon one of the parties, with a small chance of receiving returns and giving all the advantages to the other party. It is giving up in advance the only thing which, to my mind, has ever constituted an important reason for a reorganization. Bankers and brokers would find some financial convenience in the combination of all the 25 corporations in one; but that has always seemed to me a minor consideration. The value of railroad stock depends upon what the railroad can earn in transportation and what it is obliged to pay out. The value of a leased line depends upon what comes in for carrying freight and passengers and what is paid out as rent. The form of organization is of little consequence. In the present case, I see no important reason for reorganization, if the rents are to remain the same.

Through the practice of great economy and the postponement of expenditures which must be made in large sums at an early day, and largely through peculiar and temporary conditions growing out of the European war, the net income for the current year is much in excess of that of recent years, which left a substantial deficit. But, so far as I know, no one of the trustees or of the executive committee thinks this a sufficient reason for attempting to go on without a reorganization. Most of the financial embarrassments continue. The need of expenditure for improvements increases with the lapse of time. The attachment for $4,000,000 upon all the real estate of the corporation in Massachusetts remains in full force. The probability of increased attempts of organized labor to obtain higher wages cannot be overlooked. The need of some relief from these large rentals is pressing, and, in my judgment, consideration of it ought not to be postponed.

I think it right and proper that the common stockholders should contribute toward the payment of the floating debt by paying for preferred stock to be issued for that purpose, or otherwise, and that the leased lines in a reorganization ought to be guaranteed, as preferred claims in the way of dividends upon preferred stock or otherwise, rentals that should be a large proportional part of their present rentals, if enough is earned to pay them, and that the income beyond this amount should be shared between them and the common stockholders in such a way as to give each party an equitable proportion until the leased lines receive the full amount of their present rentals.

The practical question seems to be: Shall this relief be sought now, or shall the burden be fastened upon the stockholders of the Boston & Maine railroad by a reorganization which will leave them with no chance of dividends, except in times of great and unusual prosperity.

I cannot see my way clear to give up, without a struggle, all that I have ever supposed were contending for, by voluntarily closing the door against the only substantial pecuniary relief which there is any reasonable ground to hope for.

I regret exceedingly that, by reason of illness, Mr. Doherty is unable to be present at this meeting. Perhaps it is not improper for me to state that a letter has been received from him today by Mr. Hall of our board, in which he expresses his objection to some of the leading provisions of the proposed plan, to which I have referred above, and asks if a vote is taken upon it, to have it appear of record, in an informal way, that he opposes it.

RAILWAYS IN THE CIVIL WAR.—The Federal military and railway authorities in the Civil War made some enviable records. In September, 1863, following the defeat of General Rosecrans at Chickamauga, they succeeded in bringing a reinforcement from the Army of the Potomac to East Tennessee of 23,000 men with artillery, road vehicles, etc., a distance of 1,200 miles in 7 days.

RAILROAD CONDITIONS NOW AND AFTER THE WAR*

By Alba B. Johnson

President, Baldwin Locomotive Works.

Our railroads have shared the improved conditions due to abundant crops and to the war business, and during the last three months of 1915, they have experienced a large increase of earnings. The value of their stock has responded to this increase of earnings, and the large volume of money seeking investment has further raised their market quotations. The fact is, however, that under normal conditions their rates are dangerously close to the cost of the service. With phenomenal tonnage, and with the advantages of economies which are possible only in times of stress, they are able for the present to make satisfactory earnings. It has not been shown that under the restrictions imposed upon them such earnings are normal.

There is every reason to believe that at the close of the war they will fall off to such figures as will not only again make the vast capital locked up in railroad stocks and debentures unattractive as investments, but also will again restore the difficulty of securing the new capital necessary for the continued growth of railroad facilities to keep pace with the industrial and agricultural development of the country.

Next to agriculture, transportation constitutes the largest industry in the land. It is of vital importance to every other interest that the railroads should be placed upon a permanent basis of soundness and prosperity. They are the largest purchasers. When they prosper every other industry prospers. When they are compelled to stop building the extensions necessary to open new and to develop old territory, and to cease placing orders for material and equipment, all manufactures and consequently all general lines of business dependent upon industrial prosperity are depressed.

Should the railroad interests be allowed to lapse into a doubtful position as to their earnings and as to the security of their investments, it must react disastrously upon every other business interest of the country, when we come to deal with the readjustments which are to follow the conclusion of peace.

The appointment of the commission of inquiry proposed by the President, is wise and statesmanlike, and if realized it should prove productive of a broader and more liberal policy to the great interests affected.

INDIAN RAILWAY DEVELOPMENT.—The length of line operated by the South Indian Railway on behalf of the Government of India, at the close of March, 1914, was 1,455 miles, viz.: Broad gage, 446 miles; meter gage, 910 miles, and narrow gage, 99 miles. The company also operated 308 miles of meter-gage lines for owners other than the Government of India, viz.: Pondicheri (French), 8 miles; Karakkal (French), 15 miles; the Tanjore District Board, 112 miles; Travancore branch (partly owned by the Indian Government), 108 miles, and Shoranur and Cochin lines, 65 miles.

ENGLISH LOCOMOTIVE ENGINEERS AND COMPULSORY ENLISTMENT.—The national executive council of the Associated Society of Locomotive Engineers and Firemen recently adopted a resolution expressing uncompromising opposition to any system of compulsory military service "as the greatest menace to organized labor and because under prevailing conditions it is not practicable to apply any such measures with equity." A further resolution was carried in favor of the "conscription of wealth."

*From an address before the National Foreign Trade Convention at New Orleans, La., on January 27, 1916.

The Lately Revised Standard Code

Preparation of Rule-Books; The Puzzles of Rule Four; Practice with Fusees and Torpedoes; The Bell-Cord

SECOND ARTICLE

By Harry W. Forman

Being the foundation of the transportation department, rules must be so constructed that they will afford adequate support. Those who have worked with me, or have read my publications, will agree that while I do not hesitate to give expression to my views without fear, I am nevertheless always ready to admit that I am wrong when this fact is pointed out to me. Now if my readers will be equally frank with me there is room for some profitable discussion. Wise men readily admit their errors; the fatuous are much more difficult to convince.

It is not an easy matter to get up an entirely satisfactory and theoretically sound book of rules. No one who has not had several years of both road and office experience should attempt to do so unaided. Any one who sets out to revise his book of rules at this time, and to incorporate the latest A. R. A. code, should not overlook the suggestion of the Train Rule Committee to confine the book to an enunciation of principles, and to make all supplementary rules harmonize with the code. Write briefly and simply, bearing in mind the first code precept that any rule that cannot be enforced ought not to exist. Voluminous books, printed in small type, are rarely read through, never thoroughly studied, and certainly cannot be remembered.

Very little good is accomplished by sending out the proof of a book of rules by mail and inviting criticism in this manner. The matter is of enough importance to warrant bringing all interested officers to headquarters for several ten-day sessions. Such conventions are sure to bring out many good suggestions that cannot be gleaned in any other way. After such a meeting, adjourn for a few weeks; then, after having made several trips over your division and discussed your work with different employees, again look over your earlier effort and you will be astounded at the improvement you will be able to make in what at first had seemed to be a perfect production. Another meeting or two, with six months more of hard thinking and investigation, should enable you to produce a book of rules which will not cause you any future regrets. The Train Rule Committee devoted 72 days directly to the present revision. Is it unreasonable to suggest that railroad officers should give at least 30 days of their time to preparing the other half of the book, and to making a study of and interpreting the new code as it is desired to have it used on their road?

I am often asked, "Why do you insist upon exact language? We understand what is meant even though the rules do not clearly state the proposition, so why worry about the matter further? Rules are only a mere incident in operation as compared with other matters." But the committee has admitted its inability to formulate a set of rules that can be used satisfactorily on all roads, and recommends that each road should make such additions as seems best to it; and why be content with saying what you do not mean? Inaccuracy in language may result in conveying too much or too little, or in otherwise giving an erroneous impression. No one can soberly consent to be responsible for any of these faults. Now is the time to give your rules attention.

It is true that rules do not seem to be of any particular importance, except when an accident occurs; but who wants to take that attitude? Do your work painstakingly, not overlooking things because they are relatively unimportant. When you publish your book let it be understood that the matter is settled for the present. Do not permit any pasters to be added. Require the rules to be observed in the same way on the entire road.

The General Rules

I do not wish to be understood as antagonizing the standard code. The last revision is a masterpiece. But being largely a statement of principles only, it is not in shape to be used on many roads without alterations and additions. This is unavoidable. Keeping in mind all interests, especially those peculiar to southern and western roads, let us take up the general subject and try to arrive at a safe, reasonable and practical application of the rules. Possibly we may spend considerable time on things already known; but that is not necessarily harmful.

> To obtain promotion, capacity must be shown for greater responsibility.

Ponder deeply before discharging a conductor, engineman, despatcher or operator who may have made only one mistake, but has a good past record covering several years. The man selected to fill the vacancy thus created is often more or less an experiment. On the other hand, do not hesitate to look beyond your own road for good men when the home supply is not satisfactory, or just what is needed. Employees should not complain if they fail to qualify for greater responsibilities. When a despatcher proves unsatisfactory it is a mistake to assume that the situation can be improved by breaking in an operator from off the same district, unless he be an exceptionally bright young man. All that such operators are likely to know about running trains is what they have picked up while working with the despatchers. Train despatchers are not always born with that phrenological bump highly developed; at least many of them, seemingly, warrant the inference that they were not. Send for the best despatcher you may know of, wherever he may be; or apply to the Train Despatchers' Association for one. Give permanent employment only to those who are strictly first class. In deciding what to pay them, bear in mind that even eggs have advanced in price from 15 cents to 40 cents a dozen in the past twenty years. A strictly first class despatcher is worth as much to you as an engineman. Do not permit your division to suffer because of poor despatchers.

Both paragraphs of Rule A should be printed on time-tables. Include therein reference to other books necessary for employees to have while on duty.

> G.—The use of intoxicants by employees while on duty is prohibited. Their use, or the frequenting of places where they are sold, is sufficient cause for dismissal.
>
> H.—The use of tobacco by employees while on duty in or about passenger stations, or on passenger cars, is prohibited.

Books of rules and time-tables are indicated on their front pages as being for the information and government of employees; therefore to mention employees in these rules (as well as in many others) seems a waste of space.

Since it is known that alcohol can only be got out of the system by exhaling or exuding it and that its deadening effect is present for twelve hours or more, drinking it even that many hours before going on duty is as objectionable as using it while on duty. Scientists who have investigated the mat-

ter agree that whiskey-drinking to any extent or the excessive use of cigarettes, so materially befogs the brain that men who are addicted to those habits cannot be depended on; that often for a time their minds become a blank. They are not the kind of men to entrust with the handling of trains. They do not grasp a critical situation quickly. The vital duty of stopping their train on a second's notice, or anticipating the need of rear protection or keeping train orders and superior trains constantly in mind, may be neglected simply because not seen. They may have some vital matter in mind and, like a flash, it escapes them and cannot be recalled for hours. They go shopping, intending to attend to three or four matters, and forget half of them. The use of tobacco in other ways does not seem to have the same injurious effect.

Time Tables, Fusees and Torpedoes.

> Train Register.—A book or form which may be used at designated stations for registering signals displayed, the time of arrival and departure of trains and such other information as may be prescribed.

Would not it be better to make this definition read: " . . . used at stations designated by time-table, etc.," and omit the new second paragraph of Rule 83 which refers to the same thing? The purpose throughout the book is, or should be, to place everything relating to one subject in one place, when practicable.

Should an order direct that an extra be met at a station where there is a train register, the extra must be seen, or another order relating to it be given. Finding it registered as having arrived is not an identification. It might make several trips on a given date. When an order directs that a regular train be met, seeing such train is not all that is required. The register must be checked to ascertain whether or not signals were displayed to that station, or to any other.

Should a regular train be due to leave A at 9 p. m., G at 1 a. m., and arrive at Z at 7 a. m., all sections thereof should be registered on the page corresponding with the date the train is actually due at the several points. For example, at A, January 1; G and Z, January 2. Extras should be registered on the page for the date on which they actually leave or arrive.

Train registers should not contain more than enough pages to last a month. They should be dated in ink by the operator.

Conductors of work extras should never register as having tied up and thereafter occupy the main track without new orders.

Rule 4.—This rule was not changed. It is so well understood that space need not be wasted in discussing it at length. A dozen concrete examples relating to time-table changes, printed in pamphlet form and given to those interested, is the best possible way to prevent misunderstanding. Although employees may be thoroughly examined as to what must be done in any situation, they are likely to forget their instructions when it becomes necessary to apply them, without possibility of error, in a year from that time. The six particulars in which the old and the new time-tables must agree should be kept prominently in mind. "Day of leaving" means just this: Suppose the old table shows a train as daily, the new as daily except Sunday, and a change be made on, say Wednesday: An authorized train may assume the corresponding schedule on the new time-table, since it is shown as in effect Wednesdays on both tables. Keep in mind that you are dealing with but one schedule—the one in effect at the time of change. A train "authorized" is one which is due on the road at the time of change. That it may have met with delay and not got started is immaterial. It has been my misfortune to have before me for examination a great many conductors, enginemen and operators who were under the impression that a change of time-tables made all orders in their hands void. Examiners should feature this provision of the rule.

Mr. William Nichols, Chairman of the Board of Examiners, Southern Pacific System, has the best equipped car for explaining Rule 4 that I have ever seen. His new book on the subject is invaluable.

When a track is used jointly by two companies, or employees are run over several divisions now and then, it is quite likely that a crew from the foreign road, or from another division, may not run on such joint track perhaps for weeks at a time. Although a train order calling attention to a new time-table may be in effect for a week, and the fact be bulletined for a month, still there should be some permanent way of insuring against failure to secure the proper time-table. The best method is to have a Rule 5a requiring employees who have been off duty, or absent from the division for more than a week, to inquire for and themselves see that they have the current time-table. Bulletins calling attention to these changes sometimes become covered or are lost off the board. Despatchers do not always know what conductor and engineman are running a train, until some time after they have started on a run.

Rule 6.—Notwithstanding the meal sign has been omitted from the code, it is probable that all companies will still use the paragraph sign to indicate stops for meals on both time-tables and folders. Passengers are conversant with the present arrangement. Many other signs will have to be added to Rule 6. For information as to night and day order offices, it is more satisfactory to provide a column on time-tables for this information, as the work hours vary so much under the 9-hour law.

> 11.—A train finding a fusee burning on or near its track must stop and extinguish the fusee, and then proceed with caution prepared to stop short of train or obstruction.

This rule appears to have been made to accommodate roads using only red fusees. Companies who have used both stop and caution fusees probably will resist abandonment of those indicating caution, because they afford so much greater flexibility in operation. I have always felt that there was unnecessary risk in forbidding a train to pass a red fusee until it burned out, as a chance is given for a following train to strike it while thus waiting. Fusees are often thrown off in the most dangerous places. Also, to hold a train in this manner might prevent it from reaching the next station in time to properly clear an opposing superior train.

When an engineman has all the load he can handle, on an ascending grade, and must take a run in order to get up at all, to compel him to stop to pick up a fusee will very likely result in his having to double. If found while descending a heavy grade, there would sometimes be risk in stopping; as, for example, when two or three freights are drifting down a one per cent, ten mile grade, on a bad rail, and running in sight of each other, at a speed of thirty-five miles an hour. The rule requiring freight trains to keep five minutes apart is violated daily.

Caution fusees are handy to use when a train is making poor time on a grade; or when it is desired to warn a following train to look out for the train ahead while pulling into a siding; and for many other well known conditions in which it is desirable to have a train reduce speed, but it is not necessary to stop it.

I think it would be best for some companies to rewrite this rule, and provide that trains must stop and extinguish red fusees, and then run under perfect control for a given distance or time, unless the reason for displaying the fusee be discovered or explained before traveling such distance or time. Caution fusees could be passed without stopping to extinguish them, keeping under control for the same dis-

tance as prescribed for stop fusees, and under the same general provisions.

WHISTLE SIGNALS AND OTHER AUDIBLE SIGNALS.

Rule 14, paragraph k.—If not answered by a train, the train displaying signals must stop and ascertain the cause.

If the train for which signals are displayed is in sight, this stop is not necessary. By day, it is easy to determine whether the signal has been acknowledged, even though not heard, as two puffs of steam can be seen. By night, it is practically impossible for an engineman to tell whether or not all enginemen at a station answer him, unless speed is greatly reduced. I fear this rule will not be lived up to at all times. When in doubt, it is not a bad idea for an engineman to repeat the signal while passing the rear of a train. Suppose an engineman on a siding fails to get an answer to his whistle calling attention to his green signals, must he stop the passing train? What difference is there in the two propositions?

15.—The explosion of two torpedoes is a signal to reduce speed and look out for a train ahead or obstruction. The explosion of one torpedo will indicate the same as two, but the use of two is required.

Just how to railroad safely without an audible stop signal is a problem that may well cause apprehension. It is true that flagmen now and then have depended too much upon stop torpedoes; that torpedoes have failed to explode; and that irresponsible persons have attached them to rails and also removed them; but, withal, the present practice of using one to indicate stop, and two for caution, has proved fairly satisfactory. Before agreeing to such radical departure from present practice, this new rule should be well studied. In Iowa, Louisiana and California I have seen the fog so thick that a red lantern could not be seen at all; have been in blizzards in Nebraska and Wyoming when to keep any kind of a light burning was an impossibility; have ridden on engines in Tennessee during heavy rain storms when nothing in the shape of a flagman could be seen; have known rocks weighing several tons to roll down on the track on roads in Colorado where they have fourteen-degree curves (and the corresponding obscuring mountains) on two and three per cent grades, and only one track-walker to stop trains in both directions; and have known of so many hundreds of cases where the flagman's lamp failed at the critical moment, and he had no fusees at hand, that I feel uncertain as to the wisdom of adopting this new rule. The track may be undermined, or there may be a broken rail. The red flag may have blown down in the weeds, or the red lantern become extinguished. However, if the rule is used, examiners must vividly impress upon enginemen the necessity of their at once getting their trains under perfect control, and that this means to be able to stop within the range of their vision. If unable to see but a hundred feet, they must expect to find an obstruction only that distance ahead of them. There must be no more cases of slightly reducing speed, as is true of the present day practice. It is not contended that the explosion of one torpedo should operate to hold a train indefinitely, but the train should be brought to a stop, and before proceeding the engineman should assure himself that a flagman has not been passed. Rule 14, paragraph j, may be used.

Rule 16b.—Everybody has observed, on passenger trains, how the conductor would signal the engineman to stop at once, but before the train was brought to a stop (probably to let some employee get off) would notice another two-blast air signal given and the engineman release brakes and at once get under full headway. Signal 16, paragraph h, ought to be used for the latter purpose, and enginemen instructed accordingly. Sooner or later it may be highly important that the train be stopped quickly; again, the stop-signal may be given at different times by different members of the crew. A signal is needed to notify the engineman to shut off steam heat upon approaching certain stations, so that cars can be cut out. Perhaps Rule 16k can be made to serve.

Rule 16d reads, "When running—stop at next passenger station." Misunderstanding as to the exact meaning of this signal has resulted in lawsuits which were decided in favor of passengers who were not let off at the proper place. In one case I have in mind, an operator sold a ticket for a local train, but the passenger got on a through train which came along ahead of it. The conductor signaled his engineman to stop at the place where the passenger should get off, but as it was not a flag-stop for that train the engineman paid no attention to the signal. The train was finally stopped a quarter mile beyond the crossing, and the lady was let off. Notwithstanding it was a fine day and there was a good path, a jury decided that the lady was entitled to a few thousand dollars for distress of mind and "strain" in alighting from the train. It is up to officers to interpret this rule and instruct examiners. Must any passenger engineman who hears the signal stop at the next place where passengers are discharged by any train, or shall it be understood that the signal applies only to passenger trains which are scheduled to stop on flag at certain stations? Also, what is meant by "passenger station"? Is it a place where there is a station building; or does it include any place, possibly only a highway crossing, where certain suburban trains are expected to stop? All doubt should be removed and passenger men fully instructed.

Rule 17 means that the headlight must not be concealed unless the engineman knows his train is clear of the main track. If in doubt, he must not cover it until informed by one of his trainmen that his train is clear. The practice of publishing a rule requiring an engineman to keep his headlight displayed until all following trains are in to clear, is both unsafe and impracticable. No engineman can possibly always know how many trains are coming to that station. When the rule is changed so as not to require the headlight to be concealed at any time, electric headlights must be turned down when a train stops on a siding. Their brilliancy should be reduced at all times while standing near a switch on the main track to meet a train. If not done, the approaching train will be delayed in finding the switch. Also, it is difficult to see flagmen with such blinding lights in the eyes of an engineman.

25.—Each car of a passenger train must be connected with the engine by a communicating signal appliance.

Should our legal advisers be questioned as to the meaning of the words "passenger train," and "communicating signal appliance," it is probable they would decide that any train carrying passengers is a passenger train, and that the communicating appliance must be one which will enable Rule 16 to be fully complied with. On mixed trains having only a few freight cars ahead of their passenger cars, a bellcord can be used with fair success; but as such trains sometimes have twenty or more freight cars, something better must be provided; signals cannot be given that distance by stringing a rope over the freight cars. Perhaps the most practicable way to comply with the rule would be to install an electric bell on the engine, to be operated from each passenger car by sections of insulated wire.

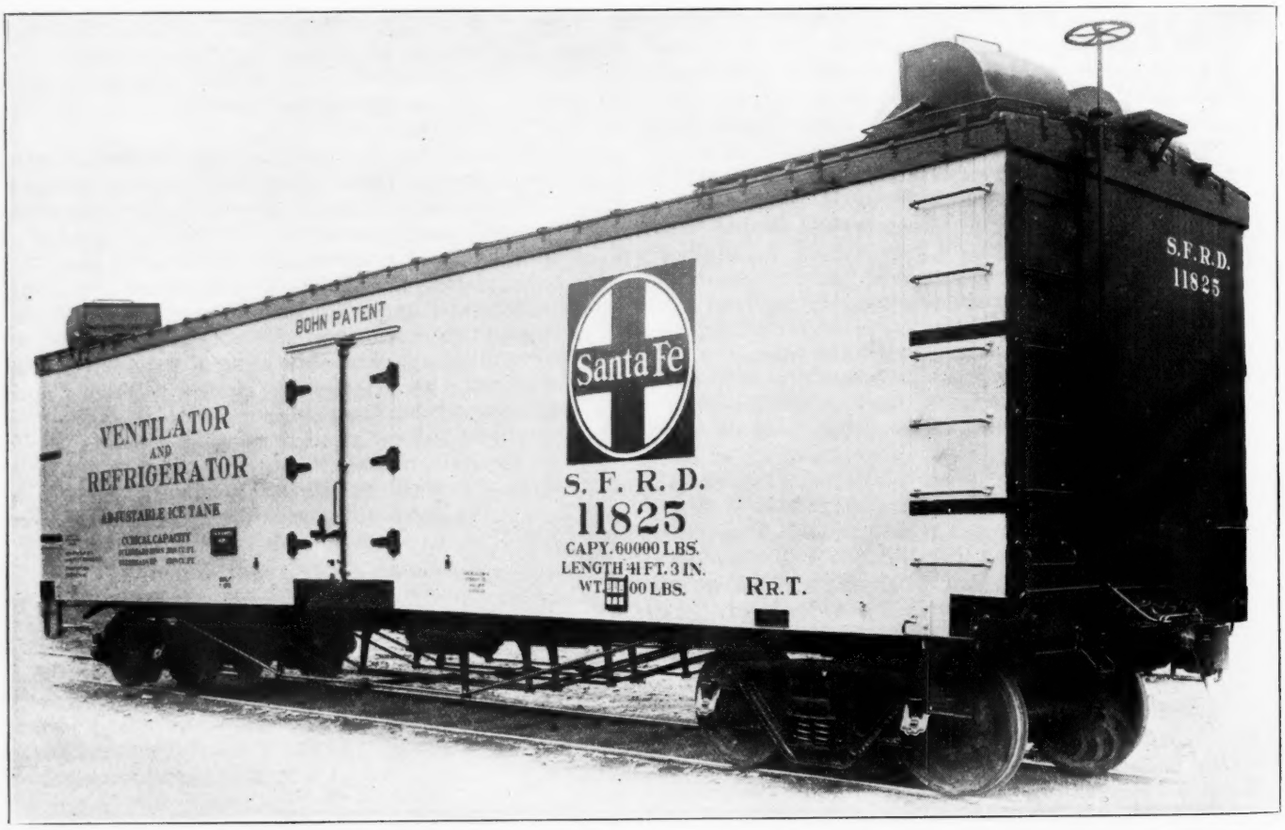
THE MALAY STATES RAILWAYS.—The 822½ miles of meter gage railway operated during 1914 by the Federated Malay States Railways Administration includes all the railways in the Malay Peninsula, and also the Singapore Railway. In 1913 the first section between the Siamese Railways and the main line of the Malay Railways on the West Coast was put in operation, and also the first section of the railways in Kelantan, a total of 55 miles of new line.

Refrigerator Cars for the Santa Fe

Special Features of the Design are the Ventilators, Drain Attachments and the Application of the Insulation

During the past year the Atchison, Topeka & Santa Fe has purchased 500 refrigerator cars which have several interesting features in their construction. Complete plans and specifications were prepared by the railway company, and the cars were built by the American Car & Foundry Company. They are of wooden construction, with metal draft members in the underframe and steel carlines; each weighs 52,000 lb. and has a capacity of 60,000 lb. They are equipped with collapsible bulkheads, which increases the cubical capacity some 15 to 20 per cent when not loaded with refrigerated freight. The following are the general dimensions:

Length over end sills	41 ft. 3 in.
Width over side sills	9 ft. 1¾ in.
Width at eaves	9 ft. 6⅞ in.
Width, inside	8 ft. 2¾ in.

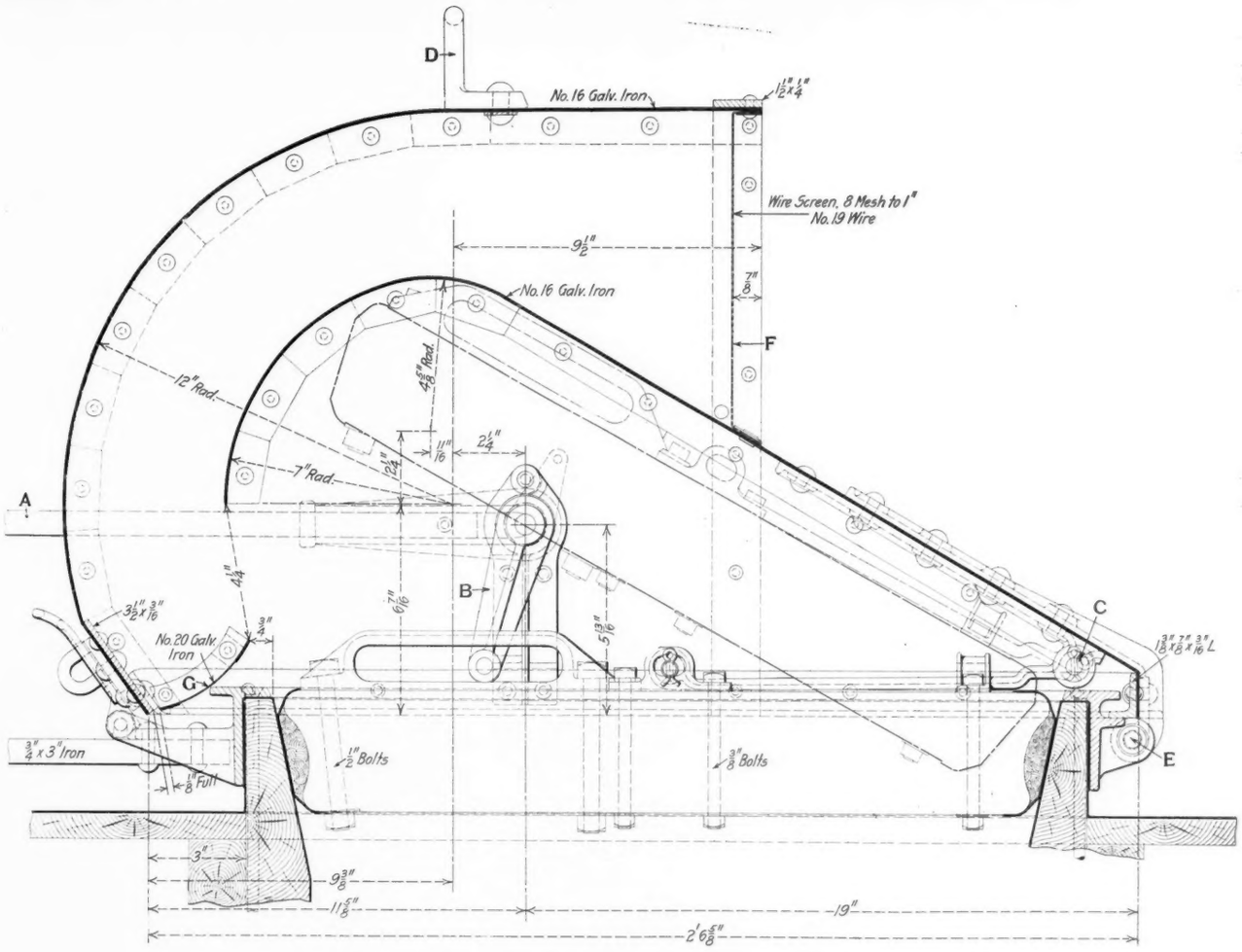


Refrigerator Car for the A. T. & S. F.

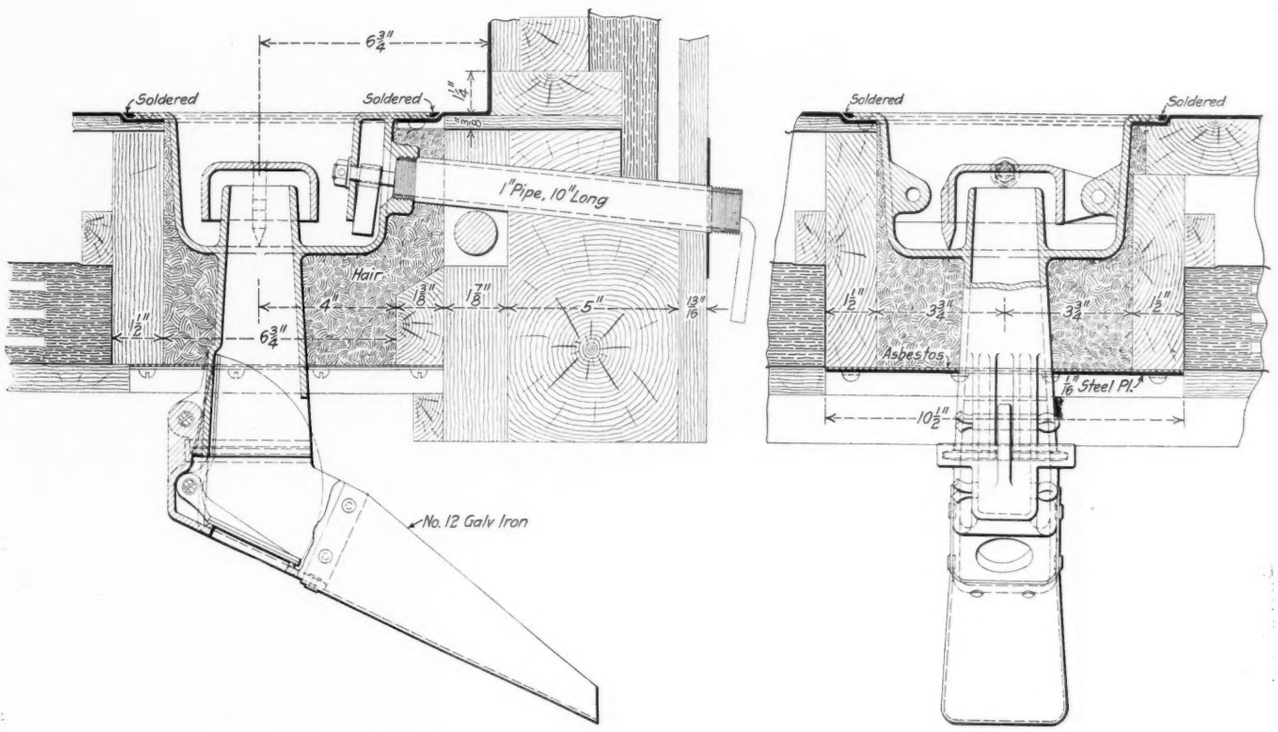
Height, inside, clear space	7 ft. 3 in.
Wheel base, total	36 ft. 3 in.
Wheel base, truck	5 ft. 4 in.
Length inside, bulkheads up	39 ft. 2¾ in.
Length inside, bulkheads down	33 ft. 2¼ in.
Height, top of running boards	12 ft. 7 7/16 in.
Height, top of brake shaft	14 ft. 1⅛ in.

The underframe is of the truss rod type, this being the standard of the road for refrigerator cars. There are six 5-in. by 9-in. longitudinal sills, the center sills being reinforced by two 9-in., 21.5-lb. channels which serve as the draft members. The end sills consist of two oak timbers 4 in. by 10⅝ in. by 9 ft. 1¾ in. bolted together with six ⅝-in. bolts and mortised to receive the longitudinal sill-pockets. All the sills are covered on top, and the side sills are covered partly on the outside with Waterdyke felt. The tie beams supporting the truss rod queen posts are 9 in., 15-lb. channels, which are secured to the draft channels by top and bottom gusset plates. There are six truss rods, 1¼ in. in diameter. The body bolsters consist of ¾-in. by 10-in. top and bottom cover plates riveted to malleable iron fillers and the draft channels, and bolted to the longitudinal sills. The body side bearings are pressed steel and slide on roller truck side bearings. Drop-forged body center plates applied with 11/16-in. shims are riveted to the bolster with ⅞-in. rivets.

The framing is made up of 2-in. by 5-in. side posts and braces, 3-in. by 4⅜-in. end posts and braces, 4-in. by 6-in. corner posts, 5¾-in. by 5½-in. door posts, and 24 vertical ⅝-in. tie rods. There are two belt rails at the sides and ends, located about 16½ in. and 4 ft. 4½ in. above the floor. The cripple belt rails which extend between the posts and braces are 2 in. by 5 in. The belt rail liners, which are continuous pieces, are 1¾ in. by 2½ in. The side and end plates are 5½ in. by 8 in. and 3 in. by 13 in. respectively. The outside sheathing and the lining are 13/16 in. thick, and the flooring is 1⅝ in. thick. The roof structure consists of two purlins 3⅜ in. by 4½ in., a 3½-in. by 5½-in ridge pole, six steel carlines of 4-in., 9.5-lb., I-beam section, and 13 wood carlines. The I-beam carlines are cut and shaped as indicated in the drawings. This type of carline is peculiar to Santa Fe freight cars



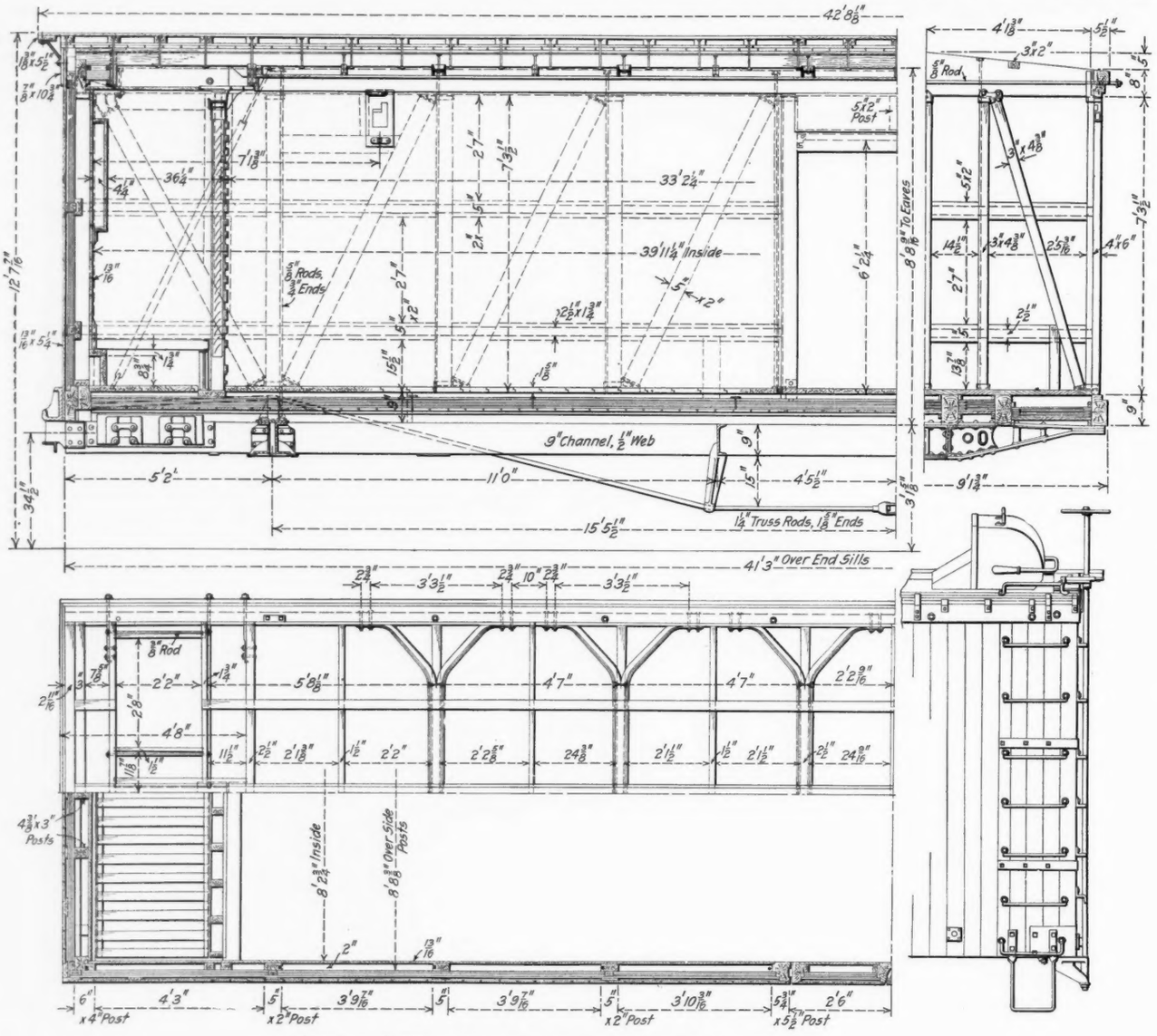
Ventilator for the Santa Fe Refrigerator Car



Malleable Iron Double Trap and Drain Used in the Santa Fe Refrigerator Cars

and provides a substantial support for the superstructure. The ceiling is 5/8 in. thick, and the roof 13/16 in. thick. The Standard Railway Equipment Company's outside flexible metal roof is used.

An interesting feature in the insulation of these cars is the method in which it is applied. Four layers of 1/2-in. Flaxlinum are applied one against the other, with no air space between them. Air spaces are provided on either side of the insulation, however, the space between the outside sheathing and the insulation being about 3/4 in. wide, and that between the lining and the insulation 2 in. wide. This construction is easier to build than one in which the air



Plan and Elevations of the Santa Fe Refrigerator Cars

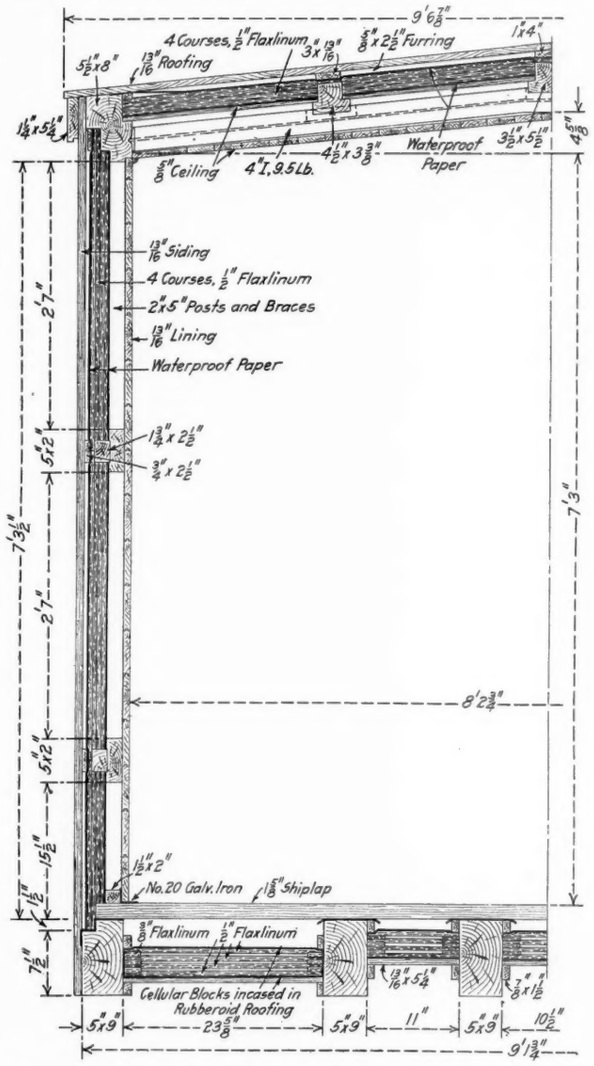
spaces are provided between the layers of insulation, and it is expected that it will stand up better in service. It also simplifies the making of any repairs that might become necessary.

The side sills are gained out 1 1/2 in. by 1 11/16 in. to receive two layers of the Flaxlinum. The other two layers start from the floor. All four layers are waterproofed up to a point 1 1/2 in. above the floor, and the entire length of the exposed surfaces of the outside and inside layers is covered with three-ply waterproofing paper. The outside layer of Flaxlinum extends in continuous pieces from the side sill to the side plate; the other three are intercepted by the belt the roof boards. The floor is insulated with four layers of 1/2-in. Flaxlinum cellular blocks supported by a sub-floor. These layers are separated by blocks of 3/8-in. Flaxlinum. The insulation extends between the sills of the car, and is entirely enclosed in waterproof material.

On account of the sudden changes in temperature encountered by the cars coming from the western coast, it is necessary frequently to open and close the hatches when carrying a load under ventilation. To do this expediently the arrangement shown in one of the drawings has been devised by the engineer of car construction. The rod *A*, outside of the ventilator casing, operates the lever *B*, which,

as the rod *A* is moved through 180 deg., raises the hatch to the open position shown by the dotted lines in the drawing. The hatch is hinged at *C*, which is attached to the casing of the ventilator. When it is desired to ice the car the whole ventilator is raised by the handle *D* about the hinge *E*, the hatch lifting with the ventilator casing. A wire screen *F* is provided at the opening of the ventilators, and a deflector *G* is added to catch any dirt and water that passes through the screen, permitting it to pass through an opening at the bottom of the deflector. The hatchway is substantially reinforced by a malleable iron frame which contains the hinge for the ventilator. Each car is equipped with four of these ventilators, one at each corner.

The traps and drains in the ice boxes are of special in-



Cross Section of Santa Fe Refrigerator Car Showing Insulation

terest. In addition to the inverted cup drain, a 1-in. pipe runs from the drain basin to the outside of the car, the drawings clearly showing this arrangement. The opening of the pipe drain is above the edge of the inverted cup, and the pipe itself is water sealed by the rib in the drain basin, the car thus always being water sealed. The purpose of this pipe is to bring the drain water well outside the track; as will be noted, the water will flow from the pipe before it will flow through the regular drain. The rod passing through this pipe, with the arm on the end, is placed there to permit the dislodging of any obstruction that may form at the opening of the pipe. The inverted cup is so built that it will fall by gravity to the closed position whenever raised. The space surrounding the cup is completely filled with hair insulation.

Among the specialties used in the construction of these cars are the following: Miner friction draft gear, type A-19-B; Creco brake beams; Andrews cast steel truck side frames; Standard Car Truck Company's roller side bearings and lateral motion device; Bohn collapsible bulkheads, and the Standard Railway Equipment Company's outside flexible metal roof.

MAN BUILDING*

By E. M. Herr

President, Westinghouse Electric & Mfg. Co.

When we stop to consider and analyze the organization of a great industry, it is, of course, quite clear that it is only by the proper co-operation and organization of men of power and ability, both in executives and workmen of all kinds, that success is attained. This granted, are we enough concerned in building up into able, strong forceful workers the young men and women, too, who in early life joined our industries?

The Man Behind the Gun.

In the last analysis, it is the man behind the gun who counts, no matter what is his position in the industry, be it high or low. Let us, therefore, consider what facilities, what incentive, what inspiration, what outlook, is given for individual improvement and growth.

We apply reserves and depreciation to our buildings and machinery that they may be kept up and developed to a better and better efficiency. We should apply the same principles to our men, only on a broader and more liberal basis because of the far greater asset value of the human element than the material to the ultimate success.

I believe the truth and value of the importance of man-building is being recognized by increasing numbers of our industrial managers, and much in the way of improvements in matters of safety of employees, consideration of physical fatigue and healthful surroundings is being provided.

Professor Scott, of Yale, who has had much to do with the training of technical men, says: "A study of individuals in most organizations will reveal the fact that human efficiency is very low; that there is a lack of incentive; that there is misapplied effort; that time is lost and little is accomplished through indisposition and lack of incentive. A little better judgment, a little better ability, a little higher intelligence would double or treble the productiveness of most men. How to bring out this, how to develop the individual and improve the environment which surrounds him is the large problem in industry."

The low efficiency in men generally, as found by Professor Scott, cannot be raised appreciably by doing things only in the nature of general welfare work, or for the encouragement and greater comfort of the individual, good and necessary as is work of this kind.

To measure up to the responsibilities and opportunities before us in the line of man-building, we must not only do the things already mentioned, but also, and what is more important and more difficult, encourage and train men to grow by willingly undertaking to overcome difficulties.

Who is competent and measures up to the ability required to shoulder great responsibilities and execute difficult duties? Only men thoroughly trained and schooled in gradually overcoming greater and greater obstacles, and who have in this way grown strong and are able to take up burdens larger

*From an address delivered under the auspices of the Pittsburgh Industrial Development Commission, September 25, 1915.

than before and carry them through a successful conclusion.

Men Who Do Great Deeds

Is the necessary training in our different industrial and commercial businesses being intelligently provided and adequately administered to bring the result just mentioned, viz.: that of providing a sufficient supply of properly trained men to carry on in the most effective way the great responsibilities we, as a nation, are now required to assume? Before attempting to answer this question, it would be well to inquire what must be included in the training that is necessary to enable great responsibilities to be borne and great duties performed?

Great knowledge and learning will not alone suffice, for, if they would, we should see the great scholars bearing the greatest responsibilities. History shows us that its greatest men were generally not men of unusual erudition, or, if they were, other great qualities of mind and character were present to a more remarkable extent.

Experience and a broad contact with affairs is not all that is required, for many men of the widest experience and who have been in touch with world-wide affairs are ineffective and almost impotent in taking up great responsibilities depending upon their own efforts and decisions.

The men who do great deeds are those who have been again and again tried in the stress and strain of hardships and difficulties, perhaps in an entirely inconspicuous way, but who have worked through, never shirking, and have willingly taken up greater and greater burdens as they came to their hands, being most concerned, not with the immediate rewards to be gained, but with the feeling that progress was being made in the work given to their hands; and that they had succeeded in their immediate task, with the result that their character, knowledge, training and, more important still, their courage and tenacity were strengthened for overcoming still greater difficulties and bearing more and larger responsibilities.

It is, I believe, rare that the individual, while going through this process of training and development which I like to call "man building," is aware of the result of his efforts; but his innate strength of character, tenacity of purpose and courage carry him through and incidentally and generally unconsciously he grows in strength and ability.

Overcoming Difficulties

So important and necessary is this discipline in overcoming difficulties that I am bringing this broad subject of "man-building" or the proper training of those who are under our direction in any way to your particular attention.

This is not a subject for teachers or professional trainers of youth only, but vitally concerns every business man, no matter what his line or how small his activities. Today no business is so small that one individual does it all, and even if a few clerks or salesmen only are employed, their training and development should be of great concern to their employer who needs real men in positions of trust and must help in their upbuilding. They must, or at least they should, be trained, so that as positions of more responsibilty arise, men to take them up can be found among those already employed and who have a more or less complete knowledge of the business.

Do not make the mistake of thinking the knowledge of the business is the important thing in determining the training of the employee. His fitness to grow depends much more on his ability to do things well, whatever the task, and also on his general character and trustworthiness. With these qualities developed, he can easily get acquainted with any required business detail.

Are we arranging for the kind of training that will properly bring about this kind of development in our employees, or are we more mere opportunists striving to get the most out of them today and trusting to chance that we may do as well or better tomorrow?

Much effort is wasted and many good men fail to properly develop by persevering, possibly in a most admirable manner, in positions for which they are unfit. If they were placed in their right fields of work, their entire energies would be used to attain higher degrees of perfection instead of hunting their special places through repeated failures. Men of good qualities are too scarce to permit of a continuance of this wasteful practice. We must see to it that the foundation upon which we are to build is properly laid out and is the kind that will support the superstructure or our building will be in vain.

No more important or helpful work toward better results from a lot of employees can be done than to stimulate in all those who handle men a keen realization of the importance of training and developing those under their charge along right lines.

Ill-Advised Assistance

Gradually encouraging men to undertake more and more difficult work, leaving them to work out the difficulties, but at the same time directing and guiding them in a way not too helpful, is good and beneficial. Helping in the wrong way, that is to the extent of practically doing the task for the man, only weakens him, and instead of his being strengthened and benefited by the discipline and exertion of overcoming the obstacle in his path, he is actually left by your ill-advised help a weaker and less able member of the organization.

Train men to work for the satisfaction of accomplishment rather than the expectation of immediate reward. They can be sure of reward and a rich one will surely come to him who can and does excel his fellows in doing things, no matter how burdensome or onerous, provided they are worthy, and especially if such excellence is in work or methods more difficult than usually encountered. The reward may not come when expected—it may even be delayed until the worker feels great discouragement and can see no prospect of the recognition and reward he knows he has justly earned.

Here courage and steadfastness are required, for the road seems dark, and progress and reward not even in prospect. Being steadfast under these conditions is in itself discipline and helpful toward the highest attainment, and one is surely building for the highest manhood who can attain it.

In addition to this, experience shows that reward for unusual and successful efforts must come, and, if deferred, as it often is, by uncontrollable circumstances, it will ultimately be paid with interest well compounded.

We have now in this country, I believe, a most remarkable opportunity for industrial and commercial development. What the grasping of this opportunity requires is a large number of men well trained in our various lines. Have we these men available? Have we been building them for our country's future needs? If not, their development is now of the most vital importance. We can no longer depend upon the very wasteful and inefficient method of the haphazard development of young men employed without regard to their capacity to grow and develop along the lines of their work. Too many under such a lack of system must necessarily fail.

Judging and Developing

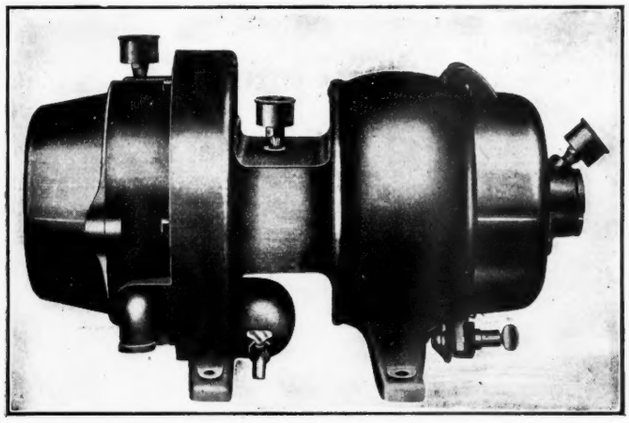
We know the standards required in industry and commerce, and must now address ourselves to systematically providing for, first, judging the capabilities of our people, and second, providing the lines of their best capabilities. This means that every manager, superintendent and foreman becomes a builder of men to the extent that the standards of performance are set clearly before them, their degree of accomplishment frequently and frankly checked and the records made, shown them with proper encouragement, when due. When this is done, they can be trusted to finish the job and to work out their own structure of manhood and attainment.

The development of man-building in an organization is

necessarily slow and filled with difficulties. Its importance is great, as any organization which cannot practically perpetuate itself internally is weak, and in an unsafe position.

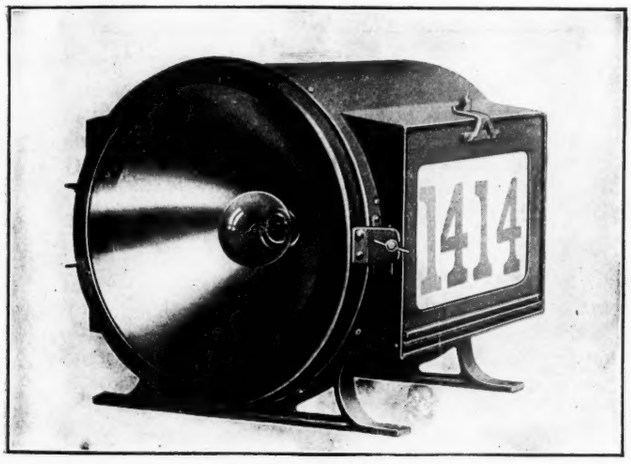
INCANDESCENT ELECTRIC HEADLIGTH EQUIPMENT

During the past few years the Schroeder Headlight Company, Evansville, Ind., has given much attention to the development of incandescent electric headlight equipment to meet the growing demand for headlights of this type. At the present time it has on the market three types of equipment,



Schroeder 32-Volt, 350-Watt Headlight Generator Set

namely, the 6-volt turbo-generator having a capacity of 150 watts and two 32-volt turbo-generators having capacities of 350 watts and 1,000 watts, respectively. The 32-volt, 350-watt system has been the most extensively used up to the present time, it being the first of the incandescent equipment of this company to be placed on the market. It has already



The Sunbeam Headlight

been made standard on some roads in view of the service it has performed. The following is a statement of the yearly maintenance cost of eight of these equipments reported by a road operating in the Middle West:

Repairs to turbo-generator*	$0.75
Labor and cost of lubrication	39.84
Incandescent headlight lamps	43.20
Incandescent cab lamps	8.51
Total	$92.30

*This item was for carbon brushes, showing a perfect record for the mechanical construction of the machine.

This is an average of $11.54 per machine per year. This road uses 150-watt concentrated filament lamps on its road engines and 60-watt lamps of the same type at the front and back of the yard engines. The equipments are handled by the roundhouse machinist, who examines the brushes and generator about every 1,000 miles. Another road operating 212 headlights of this same type finds that with 100-watt, 125-candle power lamps the requirements of the Illinois state laws are more than met. Tests of the 32-volt equipment made by this road with equipments which have been in service six months showed that the voltage did not vary more than 2¾ volts between boiler pressures of 100 lb. and 180 lb. This road also reports favorable maintenance costs, stating

Adjustable Focusing Stand for Old Type Headlight Cases

that they do not amount to one-half that spent for the arc light equipments.

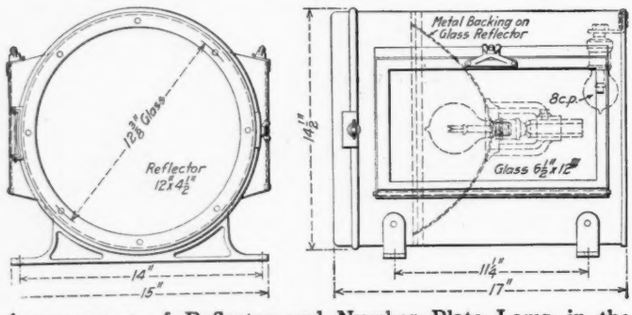
The headlight equipments made by the Schroeder Headlight Company are all of the same general design, the only difference being in the size of the equipments. They will operate at any pressure from 75 lb. up. The 32-volt outfit weighs 175 lb., and is 13 in. high, 24 in. long, and 12 in. wide. The body of the generator and the turbine is cast in one piece, insuring strength, rigidity and bearing alinement. Both the turbine wheel and the armature are fastened to the same shaft, which rotates on two sets of ball bearings, one located between the generator and the turbine wheel, and the other at the commutator end of the equipment. The generator is

of the two-pole type and operates at a speed of 2,400 r.p.m. The commutator is made extra heavy, and will permit of several machinings before renewal is necessary. The armature can be removed quickly; the outside bearing housing is readily removed by taking out three cap screws and one retaining nut.

Steam from the boilers is admitted to the turbine through a governor valve that is automatically controlled by a centrifugal governor on the end of the turbine shaft, which, by regulating the valve opening, maintains constant turbine speed.

In designing this turbo-generator care was taken to keep all parts easily accessible for inspection or repairs, and to provide large bearings. A detachable outer shell at either end provides almost instant access to the governor on one end and the armature on the other. Further removal of a cast iron housing, which is held by set screws, gives access to the turbine wheel or armature. Lubrication is provided for by grease cups and large grease wells which surround the ball bearings, making daily attention unnecessary.

The six-volt turbo-generator system is the latest development. It has a capacity of 150 watts at 2,400 r.p.m. The weight is 120 lb., and overall dimensions, 14 in. by 19 in. by 15 in. high. The machine is built either with or without the throttling governor. When used without the governor the speed is kept practically constant by means of a reducing valve supplemented by a patented friction device which prevents excessive speed. Grease is prevented from leaking out of the bearings by bushings having spiral oil grooves cut in them, which tend to return the lubricant to the bearings. This effects economy in lubrication and also prevents grease from getting on the generator windings.



Arrangement of Reflector and Number Plate Lamp in the Sunbeam Headlight

This company also makes a headlight case and fixtures, which is known as the "Sunbeam" headlight. It is made for either a 6-volt or a 32-volt system, the only difference being in the incandescent light bulb. It has a heavy 12-in. mirror glass reflector slightly colored to make the light more penetrating. This never needs replating and does not tarnish. The lamp socket is adjustable, permitting the use and accurate focusing of any size incandescent round bulb or concentrated filament nitrogen lamp up to 250 watts. The distance at which objects can be discerned varies from 800 ft. to 2,000 ft., depending on the type of lamp used.

Number plates are provided at each side of the headlight, which are illuminated by a small bulb at night.

The headlight case is substantially constructed of metal; the doors are swung on heavy hinges and secured, when closed, by thumb screws, making it dust proof. It is supported by heavy iron brackets riveted to the body of the headlight and bolted to the support on the locomotive.

Headlights with other types of reflector can be furnished in any special size and design having any size or type of number plate. This company also makes adjustable stands for incandescent bulbs for use in old type headlight cases, having large or small reflectors. These stands are adjustable to permit of properly focusing the bulb.

RISING COST OF RAILWAY CAPITAL

The Bureau of Railway News and Statistics, Chicago, has issued the following compilation, giving a comparative analysis of railway bonds listed in the New York Stock Exchange as to rate of interest, etc.

Year	3s (000)	3½s (000)	4s (000)	Portion at 4% or Under	4½s (000)	5s (000)	6s (000)	Portion Over Over 4%	Total Listed (000)	Thereof New R. R. Capital (000)	Short Term Notes* (000)	Ratio Net Income to Net Capital
1900	$43,640	$80,227	$107,800	86.12%	$5,263	$31,673	$400	13.88%	$269,003	$67,630	?	5.00%
1901	14,555	41,515	551,226	91.05	18,602	25,461	15,647	8.95	667,006	91,187	?	5.35
1902	3,803	59,253	302,670	84.15	39,500	25,147	4,239	15.85	434,612	98,432	?	5.59
1903	.....	109,448	114,924	82.86	3,209	42,564	614	17.14	270,759	?	?	5.70
1904	8,148	16,822	251,447	80,66	24,757	40,904	616	19.34	342,694	145,769	?	5.37
1905	.....	124,979	391,007	*95.80*	7,607	14,938	53	*4.20*	538,584	245,961	?	5.63
1906	1,650	17,608	243,814	85.99	31,627	10,942	257	14.01	305,898	100,860	?	*6.12*
1907	.....	10,324	217,521	85.01	11,000	29,042	105	14.99	267,992	138,747	$265,000	5.88
1908	28	53,406	287,174	67.29	33,346	58,431	73,774	32.71	506,160	230,814	274,000	4.98
1909	8,000	28,250	508,685	70.72	94,863	122,737	7,966	29.28	770,501	351,586	53,000	5.31
1910	.....	.....	225,845	50.84	104,944	83,374	17,077	49.16	†444,168	159,022	124,000	5.74
1911	.....	.....	246,344	82.66	8,313	23,273	73	17.34	‡298,004	103,640	255,000	5.31
1912	.....	.....	72,366	34.50	77,173	57,008	3,206	65.50	209,753	103,340	279,000	4.97
1913	.....	20,794	53,424	26.38	132,577	74,374	122	73.62	281,291	136,923	296,119	5.40
1914	.....	.....	51,718	14.99	98,844	179,289	133	85.01	§344,984	238,377	339,439	*4.49*
1915	.....	11,000	20,822	*9.77*	126,900	70,683	96,250	*90.23*	325,655	78,624	166,604	?

*Mostly 5 to 6% interest. †Includes $12,927,500 at 7%. ‡Includes $20,000,000 at 4¼%. §Includes $15,000,000 at 4¼%.

SWISS RAILWAY ELECTRIFICATION.—The Swiss federal government has, it is stated, definitely decided to electrify the whole of the Swiss railways. The first line to be electrified will be the Erstfeld-Bellinzona section of the St. Gothard line. The cost of electrifying the federal railways is estimated to be $100,000,000, which will be raised by successive issues of 5 per cent federal bonds.

PROGRESS OF SECOND SIMPLON TUNNEL.—The latest report for the second Simplon tunnel shows that the tunnel is over half completed, the figures of completed tunnel at the end of October, 1915, being 29.9 per cent for the south end and 25 per cent for the north end, a total of 54.9 per cent. The respective lengths are 19,431 and 16,242 ft., a total of 35,673 ft. At each end 400 or 500 ft. more of top heading and excavation work has been done. During recent months the work has been seriously hampered by continual change of forces on account of the military draft of Italian laborers.

RAILROADING IN THE WAR ZONE.—A report from Petrograd states that a detachment of Lettish volunteers recently carried out a brilliant raid on the Libau-Romny Railway. Crawling up to the line in broad daylight they cut the sentry's throat, and then broke up the rails for a distance of 10 yards. One of the volunteers disguised himself in the cloak of the dead German sentry and signalled an approaching train that the line was clear. The result was that a military train was smashed to pieces, hundreds of people being killed.

Maintenance of Way Section

Books on Maintenance of Way

Within the last six months no less than four text books have appeared which are devoted wholly or in part to railroad maintenance of way and structures. One of these is devoted only partially to this subject; another is restricted entirely to track work, and the other two are devoted exclusively to maintenance and cover practically the entire subject. While these books are all valuable additions to the library of the maintenance engineer, it must be admitted that any book intended to cover the entire subject can give but a brief outline of this important branch of railway operation, the scope of which can not be demonstrated better than by the size of the volume of Proceedings, published annually by the American Railway Engineering Association, the larger part of which is devoted to maintenance of way and structures. In addition to this, no less than three other associations annually publish proceedings devoted to special branches of the subject. In view of this, there would seem to be a field for texts devoted to restricted phases of this subject, in much the same way as has been done in the subject of structural engineering, where we find entire books devoted to such separate subjects as framed structures, foundations, masonry and timber structures. Railway maintenance engineering is becoming increasingly important and is being placed on a more scientific basis. A fuller treatment by text books devoted to individual branches would therefore seem justified.

Handling Construction Equipment

On the large roads the maintenance and distribution of the construction equipment commonly employed in the maintenance of way department, including steam shovels, ditchers, unloaders, plows, cars and other auxiliary equipment, is generally concentrated in one office for the entire system. On the smaller roads this work is frequently left to the local officers. In either case the division officers are responsible for the operation of this equipment while in their territory. While the three or four men required to operate the shovel or other special equipment will probably come with it, it is necessary to organize the track, car repair, work train and other forces locally and to provide the temporary track, water and coaling stations and other auxiliary facilities needed. These matters demand close attention, for delays to the large forces used in work of this nature are expensive. As elsewhere, efficiency in the operation of work equipment is secured primarily by thorough anticipation of the requirements, even to small details. While the output secured on any job depends to a considerable extent on local physical and traffic conditions, a comparison between operations at different points will generally show a large variation in results even after a full allowance has been made for local conditions. It is only a few weeks until maintenance of way officers will be called on to prepare for work of this kind for the coming season. To bring out information of value to them at this time we have announced a contest on "The Handling of Construction Equipment in Maintenance of Way Work," to include discussions of this phase of railway operation from the standpoint of the system as a whole, and particularly from the standpoint of the local division officers. We will pay $25.00 for the best and $15.00 for the second best papers received, and our regular space rates for all other contributions accepted and published. All contributions should be sent to the Engineering Editor, *Railway Age Gazette,* 608 South Dearborn street, Chicago, and must be received before March 10 to be considered by the judges of the contest.

The Railway Appliance Exhibit

The third week in March has come to be considered as Engineering Week by railway men, with Chicago as the center of attraction. Three activities contribute to this—the annual convention of the American Railway Engineering Association, the stated meeting of the Railway Signal Association and the annual exhibit of the National Railway Appliance Association. While the first two are primarily of interest to the members of these associations, the exhibit is of interest to many executives and operating officers and to all engineers and maintenance of way men. At no other place can one see such a complete display of new, improved and standard track, bridge, building and signal materials as here. For this reason many men not interested primarily in the conventions come long distances for the exhibit. Last year one supervisor came from the Atlantic seaboard to investigate motor cars, while the president of a large road in Texas sent four supervisors to the exhibit with instructions to report to him personally regarding any devices which they thought could be used to good advantage on his road. In addition to attending the exhibit themselves, railway officers can well afford to consider the possibility of arranging for their supervisors to spend at least one day here. A number of roads in the vicinity of Chicago also arrange for their foremen to visit the exhibit, believing that the information gained will be of sufficient interest to justify the time thus spent. An exhibit such as this is a means of education to every man interested in this field, and arrangements should be made for all to utilize it to the best advantage.

The Protection of Timber

In his address before the American Wood Preservers' Association recently, J. W. Kendrick placed special emphasis on the economy of timber preservation combined with the protection of this timber from mechanical injury after treatment. One will find few railway men today who are not convinced of the economy of the treatment of tie, bridge and other timbers as a protection against decay. In view of the general recognition of this it is difficult to explain satisfactorily the fact that less than 35 per cent. of the ties used annually are treated and that over 90,000,000 ties are used each year without protection against decay. Surely this condition deserves the serious consideratioin of railway men and timber treating engineers. However, the injection of preservative into timber alone is insufficient. It must also be protected from unnecessary mechanical abuse or the money spent in its treatment may be wasted. Many times treated ties have been removed from the track because of rail cutting, spike killing or other mechanical injury before their normal life untreated has been reached. A small part of this damage results from ignorance or carelessness, both of which can be overcome in large measure by the education of the users of this treated timber regarding its value. A large part of it results from the lack of sufficient protection from damage inflicted in its normal service. The economy of the protection of timber from mechanical injury is not so universally recognized as is that of protection against decay, but the amount of money involved in tie renewals alone is so large, and the unit cost of ties is rising so steadily, that no

road can afford to ignore the importance of this subject. The fact that the cost of tie renewals shows a net reduction of over $700,000 annually for a number of recent years on the road which has given the subject of protection of ties from mechanical injury, as well as from decay, the greatest attention for many years should furnish sufficient incentive for the complete investigation of this entire subject.

THE LABOR SITUATION

THERE is every indication that the coming season will witness one of the most serious labor shortgages ever experienced in this country. The scarcity of men is manifest even at the present time, which is ordinarily a slack season for all outside work other than that of ice harvesting. One Chicago labor agency is short 600 men on requisitions from a single railroad, while several others claim to have orders for 3,000 men which they are unable to fill. The wages offered are steadily advancing. On February 1 one large eastern railroad changed the rate for track laborers from 15 cents to 16 cents an hour, while offers of 17½ cents for track work in the middle west are already common, and one road in Illinois is now paying 21 cents. Rates in excess of this by midsummer are more than a remote possibility. The scarcity of men at present is also reflected in an increasing independence on the part of the men available.

The shortage of labor is obviously a direct result of the European war, although its effect has not become pronounced until now. The immediate cause has been the great exodus of European army reservists combined with the almost complete cessation of immigration into this country. An unconfirmed estimate places the number returning to Italy alone from Chicago and the adjacent industrial district at 70,000. Others returning in large numbers are Greeks, Servians, Montenegrins and even Austrians, for, contrary to popular opinion, many of the latter were enabled to reach Austria via Italy during the early months of the war.

While a number of railroad contractors complained of difficulty in obtaining men in the desired quantities late in the summer of 1915, there has been no real shortage until recent months. This is explained by the small amount of construction work in progress in 1915, particularly on railroads, and the general retrenchment in railway maintenance. All this has been changed with the increased prosperity of the country. The munition plants have greatly enlarged their demands for men. Many new plants, especially constructed to fill such orders, have only recently been opened, and most unusual inducements are offered for laborers of all classes. The indications are that the railroads will also increase their expenditures, and their demands will add to the present labor shortage. It is evident that the first railroads in the field will have the best chances of securing the men they need and that those waiting until midsummer will encounter serious difficulties in completing the season's work.

THE ALLOTMENT OF RAIL

AN average of over 3,000,000 tons of rails are rolled annually in this country, 75 per cent of which are of 85-lb. section or heavier. With fastenings this involves an expenditure of over $100,000,000 for materials alone, in addition to a large amount for the labor employed for placing them in the track. A small amount of this material is for other than steam railway use, and some is required for extensions and new lines, but most of it is for the renewal of rail on existing lines.

As pointed out in another column, no definite rule can be formulated to indicate the exact time at which rail should be renewed in track, as this depends upon a number of important varying conditions. Contrary to popular impression, safety is only one and frequently not the primary consideration governing the renewal of rail, for it commonly produces poor riding track and becomes unduly expensive to maintain before it becomes unsafe. The recommendations for the renewal of rail commonly originated with the local division officers and are checked more or less carefully by the chief engineer or other officer in charge of maintenance over the system. Unfortunately, this later inspection is too often performed perfunctorily. As long as the local division officers are held responsible for the maintenance of their track to proper standards they should have an influential voice in determining the amount and location of the rail to be renewed. However, as it is much easier to maintain good riding track on new rail of heavy section than on lighter, partially worn rail, it is not surprising that some divisions will request more rail than conditions may demand in comparison with other divisions. Only a careful personal inspection by one acquainted with requirements over the entire system can determine to what extent these local recommendations should be revised to insure uniformity of track over the system.

While unfortunately, because of financial and other considerations, many roads have not renewed their rail as frequently as desirable in recent years, not all of the errors made in the allotment of rail have been made on this side. On some roads rail has been purchased in larger quantities than necessary, largely because of the lack of a sufficient check on the requisitions of the local officers, with the result that money has been expended unnecessarily on this account. It is not the purpose to intimate that safety or proper standards of maintenance should be sacrificed, but simply to point out the possibility of an unnecessarily liberal expenditure for rail.

STRETCHING TRACK BOLTS

TO have told the average roadmaster or section foreman a few years ago that he could stretch a track bolt would have made one a subject of derision in his eyes, but as a result of the closer attention given to track maintenance in recent years the fact that track bolts can and are being stretched has become common knowledge. The importance of keeping the bolts tight is also becoming more generally realized, particularly because of the effect of loose bolts in causing deterioration of the joints and the rail. To insure that the bolts are kept tight one road employs several inspectors whose sole duty it is to examine them, and foremen careless in this regard are disciplined. On one division of another road on which the bolts had been neglected one day each week has been set aside on which the section foremen are required to tighten bolts. One important cause for loose bolts is the fact that they have been stressed beyond their elastic limit. After this has occurred it is practically impossible to keep them tight for any length of time. One road recently made a careful check of the number of bolts renewed on a typical section during three years and found that 160 per cent. of the total number of bolts had been replaced on individual sections in this period. Obviously there are two remedies: the adoption of means to prevent the stretching of the bolts now generally used and the use of steel of higher elastic limit. Both methods are being employed.

While only introduced a few years ago, the use of heat treated bolts is now quite common, and they are standard on a number of roads. Increased attention is also being given to the second alternative, particularly when combined with the first. A few years ago one would commonly find a track man tightening a bolt with a pipe extension on his ordinary track wrench. Recently this has been prevented by the construction of a track wrench which will not readily permit of such extension. The safe length of wrenches to employ with bolts of a certain diameter and grade of steel is capable of fairly accurate determination. The article on this subject by Earl Stimson in another column is of practical value to track men at this time and worthy of careful study and application

to determine whether track bolts are not being overstressed and their usefulness destroyed through misdirected zeal.

NEW BOOKS

Proceedings of the Twenty-fifth Annual Convention of the American Railway Bridge and Building Association. 432 pages. Illustrated. 6 in. by 9 in. Bound in cloth and paper. Published by C. A. Lichty, Secretary, C. & N. W. Ry., Chicago. Price $1.

While the proceedings of this Association always contain a large amount of information of practical value to railway men engaged in the design and maintenance of bridges, the volume just issued has more than the usual amount of information of this character. Among the reports deserving special mention in the proceedings for this year are those on pile and timber trestle bridges, water tanks, reinforced concrete bridges, and concrete culvert pipe and piles. Other reports presented in the proceedings include those on locomotive cranes, small coaling stations, the cost of structures, warnings for side and overhead obstructions, and the protection of grade crossings. Monographs are also included on manila rope, water waste, and efficient organization in bridge and building departments.

Reinforced Concrete Construction. Volume 3, Bridges & Culverts. By George A. Hool, associate professor of structural engineering, University of Wisconsin. 688 pages, illustrated, 6 in. by 9 in. Bound in cloth. Published by McGraw-Hill Book Company, New York. Price $5.

This is essentially a book on arches, as all but 120 pages are devoted to that subject. Special credit is due the arrangement of the 156 pages on arch analysis. The complete sample design of an arch will also be found of value to the beginner. Details of arches, covering 87 pages and consisting largely of illustrations, and a chapter on "Typical Design," 72 pages, composed entirely of illustrations, give examples from a great many different structures. A chapter on Patents outlines the rudiments of patent law and gives examples of existing patents on reinforced concrete arches. The following chapters on slab, girder and cantilever bridges, are devoted almost entirely to highway structures though some space is given to reinforced concrete trestles and subways as used by railroads. The chapter on reinforced concrete for steel bridges, covering ballast deck slabs and abutments seems short. Thirty-six pages are devoted to the subject of culverts, of which more than half are on culvert pipe, abstracted largely from reports of tests made at the universities of Illinois and Iowa. Parts 4, 5, 6 and 7 of the book are devoted to concrete plans, estimates and detailed accounts of the actual construction of individual projects, including a reinforced concrete pile trestle and concrete slab bridges for track elevation. Chapters of particularly special character are those on three hinged-arches and the details of arch hinges.

Live Load Stresses in Railway Bridges. By George R. Beggs, assistant professor of civil engineering, Princeton University. 123 pages, illustrated, 6 in. by 9 in. Bound in cloth. Published by John Wiley & Sons, New York. Price $2.

This is a book essentially for the man who is constantly or frequently engaged in stress calculation, either in the design of new structures, or in the investigation of old ones. Stresses caused by moving concentrated loads are treated by the combined use of influence lines and algebraic methods. The influence line is connected by this treatment with tables of moments and loads in an entirely new manner. Special application of the method is given in separate articles devoted to girder bridges, pier reactions through Pratt trusses, three hinged-arches, etc. Nearly half the book is devoted to tables of various kinds designed to expedite the work of bridge stress analysis.

ENGLISH SOLDIERS RELEASED TO REPAIR RAILWAY EQUIPMENT.—Because of the congestion on the English railways, partly caused by the number of cars and locomotives needing repairs, many railway employees now training and serving at home have been released from military service.

Letters to the Editor

LAYING RAIL WITHOUT SPACING JOINT TIES

CHICAGO, Ill.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Practically all the new rail laid in the main tracks of The Belt Railway of Chicago and the Chicago & Western Indiana in relaying operations during 1914 and 1915 and some previous to those dates was laid without spacing the joint ties and slot spiking the joints as had been the former practice. This rail has now been in service a sufficient length of time to show that much has been gained by the new practice while the additional cost of material is confined to two additional rail anchors per rail to compensate for discontinued slot spiking.

The angle bars used were not designed with the new method of laying track in mind and contained the usual features of extended base and slots for anchor spiking. Now that rail anchors have been developed which afford a better method of anchoring track, and in order to take full advantage of the possibilities of the new method, a splice that does not extend beyond the base of rail should be used. Some of the advantages to be gained by the new method are given below.

By eliminating the necessity of spacing ties it is practicable to apply rail anchors at the time the rail is laid before any traffic passes over the new rail. This enables the expansion provided at the joints to be held as laid, while with the old method it was quite common for the rail to "run" before it could be anchored, bunching the expansion. It was then necessary to drive the rail back with resulting expense for labor and excessive wear and tear on splice bars and bolts.

Eliminating the spacing of ties permits important economies to be effected at the time of laying the rail. The spacing of ties under our conditions is usually more expensive than the relaying of the rail itself.

With the best attainable splice bars the weakest part of the track is still in the joints. Respacing the ties and moving them off their traffic-tamped foundation makes the track still weaker at this point. The joints require much more resurfacing for some time after being disturbed, requiring additional labor, while the track materials themselves depreciate under this service.

A considerable amount of track is insufficiently anchored. This condition should not exist but it is difficult to determine at times just the right number of anchors to apply. In such cases the anchored ties are dragged onto untamped foundations. When these are joint ties the result is that the weakest point of the track is carried on the poorest foundation. When the joint ties are not anchored travel of the rail leaves them undisturbed on their tamped bed. The ties which are dragged are removed from the joints where the least harm will result.

When splice bars are depended on for anchorage the joint bolts are required to perform additional work in holding the rail from running, which requirement is more severe than that for which they are really intended. I find that bolts laid in tracks according to our revised method require less attention than under former conditions. This feature is of much importance as almost no other condition will cause track to deteriorate as rapidly as loose bolts.

When a splice bar does not extend beyond the base of the rail there is no necessity for providing a special pattern of tie plate for the joint ties. The use of two types of tie plates, one for the joint and the other for the intermediate ties, causes some confusion when inexperienced labor is employed and the tie plates are misapplied at times. The greatest

advantage resulting from the elimination of the special joint plate arises from the fact that such a plate cannot usually be provided with a shoulder and the need of a shoulder tie plate at the joint is even greater than elsewhere.

E. D. SWIFT,
Assistant Engineer, Maintenance Department,
The Belt Railway of Chicago.

ABSTRACT OF ENGINEERING ARTICLES

The following articles of special interest to engineers and maintenance of way men to which readers of this section may wish to refer have appeared in the *Railway Age Gazette*, since January 21, 1916:

Unsettled Points in Slab Design.—Much attention has been given in the last 15 years to tests of reinforced concrete, but the need of tests of special character, for the determination of certain facts in the design of slabs for railway structure was discussed in an editorial in the issue of January 28, page 149.

Reinforced Concrete Train Sheds of Unit Construction.—It has become a rather common practice to build concrete structures in units to be erected after they have hardened sufficiently. The use of a special method of unit construction for train sheds and other structures was described in an illustrated article in the issue of January 28, page 155.

A New Coal Pier for the Baltimore & Ohio.—This road has just begun work on a new coal dock at Baltimore, which was described briefly in an illustrated article in the issue of January 28, page 169.

Clearance Legislation.—Bills have been introduced in each house of Congress, for the regulation of the operating clearances on railroads. These bills and similar regulation in the various states were discussed in an editorial in the issue of February 4, page 188.

Construction Work on the Paducah & Illinois Railroad.—A connection between the Chicago, Burlington & Quincy, and the Nashville, Chattanooga & St. Louis, is to be accomplished by a bridge over the Ohio river at Metropolis, Ill. A 12-mile railroad constructed in connection with this, which has just been completed, was described in an illustrated article in the issue of February 4, page 203.

The Canadian Northern Extension to Vancouver.—The Canadian Northern has just completed the building of its line into Vancouver via Yellow Head pass and the North Thompson river. The heavy construction involved in this project was described in an illustrated article in the issue of February 4, page 210.

Two Large Concrete Viaducts on the St. Paul.—Reinforced concrete arch structures of novel design were recently completed by the C. M. & St. P. in Washington. An account of the special features of these structures, and an outline of the construction methods were given in an illustrated article in the issue of February 11, page 241.

Methods of Producing Sound Steel Ingots.—This phase of rail manufacture has received much attention in recent years. A discussion of this subject and a description of three different processes were given in an illustrated article in the issue of February 11, page 251.

LECTURES ON STRUCTURAL TIMBERS AT THE UNIVERSITY OF WISCONSIN

A course of 14 lectures on structural timbers has recently been arranged in the College of Engineering of the University of Wisconsin, to be given by members of the staff of the United States Forest Products Laboratory. This course is largely a development from the results of the researches carried on by the Forest Products Laboratory, and includes the latest and best information on the subject.

While engineering courses have hitherto included general information on the subject of timbers and timber designs, there has been a dearth of specific information concerning the individual species. At the present time only a limited number of species are well known to engineers, and in the case of some of these there is much confusion and uncertainty concerning their names and identification. There are also other species which may be very satisfactory for structural purposes, but which have not been used to advantage because of lack of information.

As the result of several years of study and experiment, the Forest Products Laboratory is able to formulate much more exact information along these lines than was formerly available, and has organized this information into a brief course of lectures carefully adapted to the needs of the engineering student. The course will cover the structure of wood, with reference to the arrangement of cells, annual rings, etc.; the mechanical properties; durability, with special reference to decay, conditions of growth and preservative treatments; grading rules; species used for structural purposes; design of timber structures, with special attention to working stresses; building codes and specification of the National Board of Fire Underwriters.

SLIDES AT PANAMA

In a supplement to the Canal Record for January 5, 1916, George W. Goethals, major-general and governor of the Panama Canal, gives a lucid and full account of the difficulties encountered in the digging of the Panama Canal in consequence of earth slides, and the measures taken to overcome them, which is of particular interest because of the frequency with which slides are encountered in railway work.

He classed the slides according to causes, under three different heads which are outlined in the report as follows:

"First, those caused by the material assuming its natural slope in cases where the banks were left steeper than the angle of repose for the particular material through which the excavation was carried; second, those due to the fact that material more or less permeable reposed on relatively harder strata which inclined toward the cutting, with the result that when the excavation reached a level near or below the intersection of the harder plane with the sides of the prism, the superimposed mass moved into the excavated area; third, those which resulted from the breaking of weak strata underlying the bank, rupture being produced by the concentration of the weights of the bank due to the removal of the material from the prism."

Owing to the size of the project, the climate and the great precipitation, the difficulties that the slides presented in this work were unquestionably of much greater magnitude than had ever been previously experienced from this cause in the history of engineering. The problem received careful study by the best experts available, during the progress of the excavation, but owing to the lack of precedents and exact geological data, it was not always possible to predict the effect of the various remedial measures taken during the course of the work.

Roughly speaking, the only successful solution in each case appears to have involved the removal of sufficient material to obtain the slope of equilibrium. This work was done preferably by steam shovels or sluicing high up on the slope to remove the superimposed loads and thereby obtain the condition of equilibrium as soon as possible. In many cases, however, conditions were such that this means of attack was not feasible, and it was necessary to resort entirely to dredging in the canal prism into which the material was delivered by the action of the slides.

ROCK ISLAND TRACK AWARD

The Chicago, Rock Island & Pacific has awarded prizes of $100 to the following roadmasters on those territories showing the greatest track improvement on each division or group of divisions. One section foreman on each roadmaster's subdivision was also awarded a prize of $50 for the greatest improvement in track on his individual section:

Illinois Division: G. W. Kohn, Joliet, Ill.
Iowa Division: J. B. Pugh, Atlantic, Ia.
Missouri Division: D. Kanan, Trenton, Mo.
Minnesota Division: J. McNulty, Waterloo, Ia.
Dakota Division: J. W. Peterson, Estherville, Ia.
Des Moines Valley Division: J. Dulin, Oskaloosa, Ia.
Nebraska Division: L. Brien, Fairbury, Neb.
Colorado Division: J. S. Pollard, Goodland, Kans.
St. Louis Division: V. B. Simpson, Eldon, Mo.
Kansas Division: H. O. Sinsabaugh, Herington, Kans.
El Paso Division: J. H. Logan, Pratt, Kans.
Arkansas Division: D. B. Griffin, Booneville, Ark.
Indian Territory Division: J. A. Trainor, Haileyville, Okla.
Louisiana Division: R. T. Gollehon, El Dorado, Ark.
Pan Handle and Amarillo Divisions: Geo. Woods, El Reno, Okla.
Oklahoma and Southern Divisions: J. B. Mabile, El Reno, Okla.

The Largest Railroad Track Scale in the World

The New York Central Has Recently Installed One at West Albany, N. Y., with a Capacity of 825 Tons

The New York Central has recently installed at West Albany, N. Y., a track scale which is undoubtedly the largest in the world. The scale is 100 ft. long, and has rigid deck construction with provision for a 5-ft. protective overlap at each end, thus giving a 90-ft. weighing rail. The scale is built in six sections and each section is designed for a concentrated load of 275,000 lb. The secondary or extension levers are designed to transmit this load as applied simultaneously at each section to the fifth lever

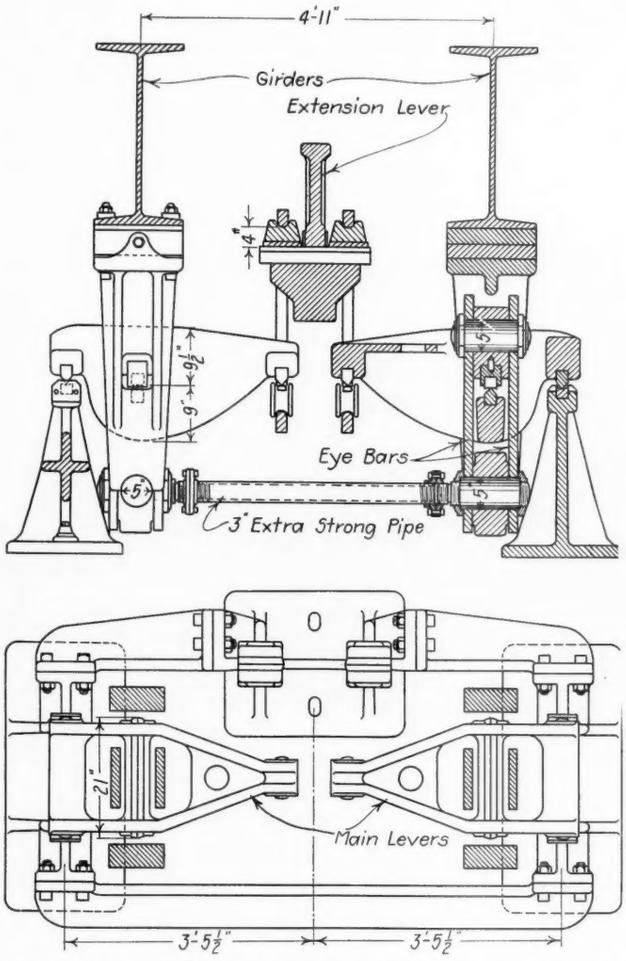


Fig. 1—Plan and Cross Section of a Scale Section Assembled

and thence to the weighing beam so that the lever system is capable of sustaining a theoretical load of 1,650,000 lb.

The question naturally arises why such a heavy load should be assumed in the design of the scale. The New York Central desired a scale of sufficient length and capacity to weigh the largest locomotive or car that was likely to be built for many years to come and it was felt that the scale should furnish a reliable and accurate means for the quick determination of weights for all classes of heavy locomotives and cars. A weighing capacity of 275 tons was therefore decided upon and after a series of investigations concerning the reactions encountered under an assumed loading of the largest existing locomotives, it was decided to design the scale for a theoretical load of 275,000 lb., *i. e.*, one-half of the weighing capacity, per section, and that the load should be considered as acting simultaneously on all the sections. It was also decided that with the above loading, the limiting stresses recommended by the American Railway Association specifications for track scales, should not be exceeded.

In considering the heavy concentrated load of 275,000 lb. per section or 137,500 lb. per main lever, there was presented the problem of producing a knife edge in the main levers of sufficient length to reduce the load per lineal inch below the 7,000 lb. designated by the specifications and to support it properly to insure an equal distribution of the load throughout its length without undue deflection. The design heretofore used with a single web lever with projecting hubs on either side for the support of the pivots was abandoned and a double web construction was adopted. This is shown in Fig. 1. With the double web construction connected by heavy transverse sections over and under the knife edge a rigid and efficient support is obtained throughout the full length of the knife edge. The load and fulcrum knife edges

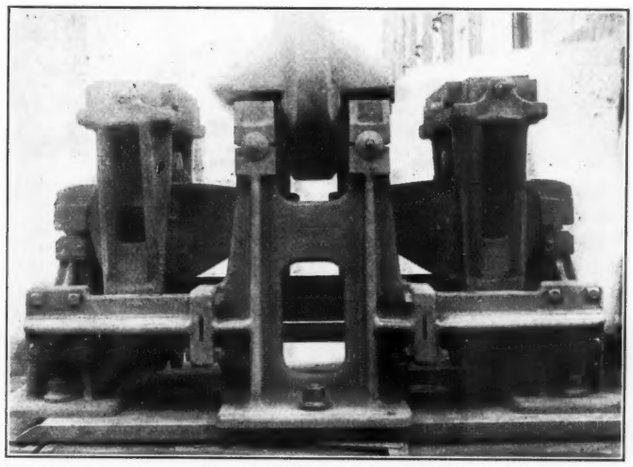


Fig. 2—A Single Section Assembled Complete with Extension Lever in Position

in the main lever are 21 in. long and they are machined true and ground to fit into machined recesses in the lever.

The main levers are made of cast steel and weigh, finished, 906 lb. each. In order to affect a true suspension for the load imposed upon the main levers, bridge eyebars 10 in. by 1½ in. were used. These eyebars engage 5-in. diameter pins above and below the main load knife edge. Fig. 1 shows the assembly drawing of the suspension links and bearings. The main bearing block above the knife edge is bored for the reception of the 5-in. pin and is recessed at the lower edge for engagement with the bearing which extends throughout the full length of the knife edge and carries the hardened bearing steel for engagement with the knife edge. The lower pin engages with a cross bar designed with trunnion ends, which in turn supports the main bearing to which the longitudinal girders are attached. With this construction the heavy loads are transmitted through the theoretical center lines and an efficient and flexible suspension is obtained.

To preserve the true relative position of the main lever stands with the end and middle extension lever stands, and to insure stability, a system of transverse bracing is used. This bracing consists of heavy T-section members securely at-

tached by flange connections to the lever stands. This connection is shown in Fig. 2.

The end of the middle extension levers were designed on the assumption of a theoretical concentrated load of 275,000

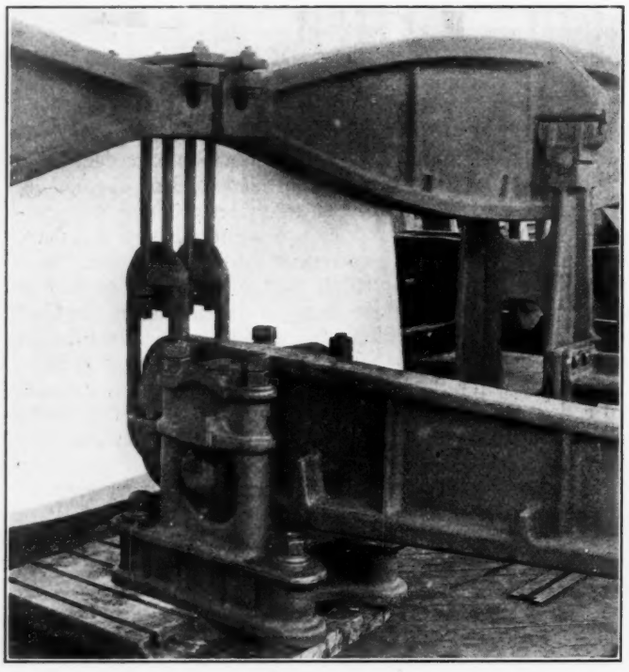


Fig. 3—Connection of Middle Extension Levers to Fifth Lever

lb. acting simultaneously at each section. This necessitated a bearing surface for the fulcrum knife edges of the middle extension levers of 25 in. or 12½ in. on each side of the lever. To insure an even distribution of the load over this length of knife edge, a special compensating bearing was designed for both the end and middle extension lever stands. This bearing may be seen in Fig. 2. It comprises a spool engaging with curved surfaces of slightly greater radius in both the stand and the bearing block. With this construction a full line contact is insured for the long knife edge.

The connection between the middle extension levers and the fifth lever is shown in Fig. 3 and is accomplished by two cast steel loops encircling a continuous saddle block which engages with the butt pivot of the fifth lever. The loops in turn are connected by bolts with the saddle blocks engaging with the end pivots of the middle extension levers. As the scale is built in six sections and two middle extension levers are used on each side of the transverse center line, it is necessary to provide efficient means for connecting them. This is accomplished with a short, even lever shown in Fig. 4. This lever is supported by a massive stand fitted with removable caps and designed to resist the upward thrust due to the transmission of the load from one extension lever to the other. Compensating bearings are provided for this lever at all knife edges. The same design of stand is used for the fulcrum bearing of the fifth lever.

The weighing beam is of the Fairbanks type-registering form and is made of high grade, close-grained cast iron, fitted with a steel insert for the main notches. The beam is of 350,000 lb. capacity and it is fitted with a 200,000-lb.

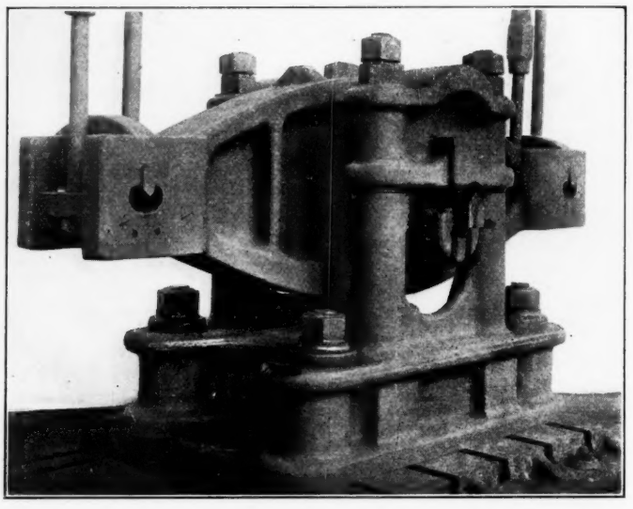


Fig. 4—Heavy Uplift Bearing for Even Lever

auxiliary registering weight, thus giving a total weighing capacity of 550,000 lb.

Fig. 5 shows half the scale set up in the factory erecting shop. Great care was exercised in both the design and manufacture of all the levers to provide for an even distribution of metal about the pivot line and all pivots are located prac-

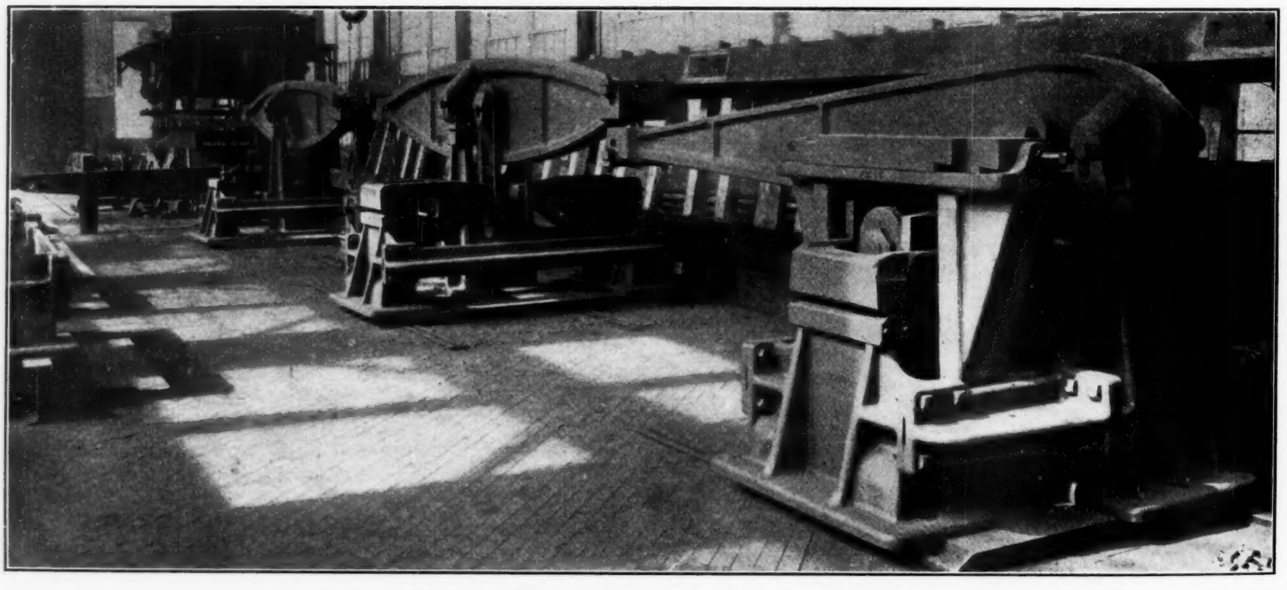


Fig. 5—Half of the Scale Set Up in Factory

tically on the neutral axis of the section. All nose irons were machined and fitted to preserve parallelism of the knife edges which is especially important when they are of such great length.

The material used for pivots and bearing steels throughout the scale is high grade chromium-vanadium alloy steel with a tensile strength of 200,000 lb. per sq. in., which was hardened in oil. With this grade of steel little trouble was experienced in keeping the long knife edges straight and consequently little grinding was necessary after the pivots and bearings were hardened.

The following table gives the details of the lever system:

Description	Length	No. used	Weight, each	Material	Multiplication
Main lever	3 ft.	12	906 lb.	Cast steel	3
End extension	12 ft. 6 in.	2	3,160 lb.	Cast iron	8
Middle extension	15 ft. 9 in.	4	6,465 lb.	Cast iron	8
Even lever	4 ft. 3 in.	2	985 lb.	Cast iron	...
Fifth lever	10 ft. 6 in.	1	1,925 lb.	Cast iron	8⅓

It will be noted that the lever system is arranged to give a multiplication of 200 at the tip end of the fifth lever. A shelf lever with a multiplication of 4 is used, thus giving a multiplication of 800 at the butt of the weighing beam.

The main girders are composed of 30-in., 200-lb. girder beams and the transverse beams supporting the dead rail are 15-in., 140-lb. girder beams. The deck is composed of two thicknesses of 1¾-in. planking with a layer of tarred paper between.

The foundation is built of concrete reinforced by two layers of ⅞-in rods, spaced 6 in. center to center. These layers are 6 in. from the bottom and top surfaces of the footing respectively which is 3 ft. 1 in. thick. The pit is 8 ft. 11 in. deep from the base of the lever stands to the base of the weighing rail. The total weight of the scale completely installed is about 300,000 lb.

After installation at West Albany, the scale was tested with two test cars, weighing respectively 80,000 and 60,500 lb. Each section was tested separately with each of the cars and a variation of less than 10 lb. was established by the results. The same degree of accuracy was attained when both cars were used, giving a test load of 140,500 lb. and the sensibility reciprocal was 20 lb. The scale was furnished by the Fairbanks Company, New York, for whom it was designed and built by The E. and T. Fairbanks Company, St. Johnsbury, Vt.

THE DRAINAGE OF RAILWAY ROADBEDS*

By M. C. Blanchard

Engineer, Eastern District, Atchison, Topeka & Santa Fe, Topeka, Kan.

The importance of proper and adequate drainage for railway roadbeds has always been realized, but the rainy season of 1915, owing to its length and the heavy precipitation, has served to emphasize the fact to those actually engaged in the maintenance of track. Ordinarily the usual methods of drainage, such as cut and surface ditches, when properly maintained, are sufficient to carry off the surface water, and provide a fairly well drained roadbed. Frequently conditions occur, however, when these ordinary means are inadequate, and it is necessary to provide special systems of drainage to carry away the water which sinks into the roadbed.

The condition most commonly requiring these systems is the presence of a pocket or bed of porous material of considerable depth, underlying the track, into which the surface water sinks and is retained to a greater or lesser degree by the adjacent earth. This condition occurs in both cuts and fills and its cause is fairly well understood. In cuts the ditches frequently become blocked by dirt which washes or slides in from the sides. The surface water is thus prevented from escaping and gradually sinks into the roadbed, making it soft and spongy. Occasionally this same condition is caused by springs or seepage in deep cuts. The subgrade thus softened is not able to support the track and the heavy loads to which it is subjected, with the result that track and ballast are pushed down, displacing the underlying earth which heaves up in the cut ditches. When this happens the

Installing a French Drain

track is brought up to its former level on ballast and eventually the track forces remove the earth which has been displaced and clean out the cut ditches. If this is repeated from year to year, however, it results finally in a track underlaid for a depth of several feet with a material much more porous

French Drain at the Foot of an Embankment

than the adjacent earth and into which the water pours without any means of escape.

In fills this same condition is caused in several ways. Frequently insufficient allowance has been made for the shrinkage of embankments and the track thus settling below the established grade is raised on cinders or ballast. Also in a great many instances the original embankments were

*Presented before the annual meeting of the Kansas Engineering Society, Manhattan, Kan., January 18, 1916.

not built with slopes flat enough to prevent slides when the filling material became more or less saturated under heavy rains. These slides in many cases extended to or under the track and are temporarily repaired by dumping in cinders or ballast in sufficient quantity to make the track passable. Again this condition is brought about by the continual raising of the track on ballast as it is surfaced from time to time. In all of these cases the shoulders of the embankment are usually brought up with earth secured at a time and in a manner most convenient to the track forces. The result, however, is the same as in the cut in that the track becomes underlaid with a stratum of porous material enclosed within more or less impervious earth.

Vitrified Pipe Covered with Cinders in a Side Ditch

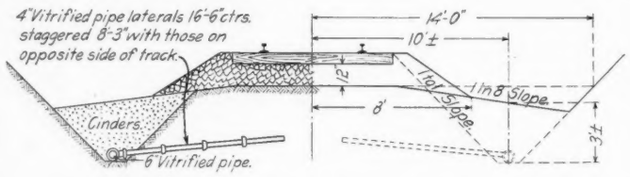
As a result it is almost impossible to maintain track in proper line and surface even with a large continual expenditure for track labor. In the case of embankments continual slides are caused by the seeping through the fill of water, which collects in these porous pockets, thus saturating a plane extending from the bottom of the pocket to the outer face of the embankment, upon which the superimposed material slips easily.

To alleviate these conditions in cuts the Atchison, Topeka & Santa Fe, during the past year has been using a system of tile drains on its eastern district. The side of the cut is produced down to a point about 3½ ft. below subgrade to form one side of a ditch in which the main tile is laid. The other side of the ditch is formed by a plane extending from the upper side of the end of the track tie, with an approximate slope of one to one, until it intersects the plane 3½ ft. below subgrade. Using the Santa Fe standard roadbed this results in a ditch about 3 ft. deep, 1 ft. wide at the bottom and 7 ft. wide at the top. In this ditch is placed the main tile which usually is 6-in. vitrified, bell end pipe. Connected to the main by means of tees are 4-in. laterals spaced 16½ ft. apart and extending usually to a point between the rail and the center of the track. These laterals are laid so as to tap the bottom of the ballast or cinder pocket. In most instances a line of tile is laid on each side of the track and the laterals are staggered so that one lateral occurs in every 8¼ ft. of distance. The lateral trench is usually back-filled with the same material with which the track is ballasted while the main ditch is filled with cinders, the surface of which conforms to the bottom of the original cut ditch. The ballast, is then redressed to standard section and the job is complete.

For draining these pockets in embankments the Santa Fe has been using what are known as French or rock drains. These are simply trenches, filled with broken stone. These trenches are usually from three to four feet wide, ordinarily at right angles to the track and extend to a depth sufficient to drain the troublesome pocket. In some cases they extend entirely through and in other cases only from about the center to one face of the embankment depending upon the size, location and character of the pocket to be drained. The distance they are spaced apart also depends upon these same conditions, and is determined by the engineer from an examination on the ground. The bottom of the trench is made with sufficient grade to insure a flow of water from the pocket to the face of the embankment. This grade should be made great enough so that slight future settlement of the embankment will not destroy its effectiveness. The rock used for filling the trench is usally one-man stone. In some of the drains rock of this size has been carried up to within one foot of the top of the trench and the remainder filled with crushed rock of the size used for ballast. This was done on the theory that the finer rock on top would prevent dirt from sifting in and gradually filling the interstices in the larger sized rock, which, should it occur, would tend to lessen the effectiveness of the drain.

There have been several places where conditions were such as to afford very poor means for carrying water away from the foot of the embankment in which these drains have been installed and in such cases a lateral drain has been constructed at the foot of the slope into which the cross drains connect. This lateral drain is similar in construction to the cross drains and carries the collected drainage into the nearest ravine or depression of sufficient depth to carry the water away from the roadbed.

In places where the fill is light and the pocket or stratum to be drained is not deep, a condition which usually results from the repeated raising of the track from season to season and the consequent raising of the shoulder with earth to permit of standard ballast dressing, the drains installed are ordinarily smaller than those mentioned above, being generally tbout two feet wide and filled with spalls or rock smaller than one-man size. In other places where fills are very heavy, or where side hill construction is encountered, and the drainage conditions are so bad as to make it impossible to keep the road in operation on account of slides, these drains, particularly those used as laterals, have been made much larger than any of those above described and



Cross Section of Roadbed Provided with Pipe Lateral Drains

serve as a wall of bracing or retaining the roadbed as well as a drain.

It has frequently been found necessary to flatten the slopes of embankments as well as to install these drains to prevent the occurrence of slides entirely. Often the nature of the earth is such that it will not stand on a 1½ to 1 slope as is usual in the construction of embankments and in such cases the installation of drains will not entirely prevent slides. On the other hand very flat slopes show a tendency to slide where porous pockets exist under the track and, therefore, in such cases a combination of a flat slope with rock drains should be used.

The performance of these systems of drainage has been satisfactory in every way. The amount of water drained from roadbed by them for long periods of time, after rainfall has ceased, is surprising. The cost of these systems is greater than that of the methods ordinarily used but it is justified by the better and safer track obtained and by the decreased cost of maintenance.

Principles Governing the Allotment of New Rail

A Discussion of the More Important Considerations and the Weight Given to Them on Different Roads

There are few problems in maintenance of way work which require the exercise of more mature judgment than the allotment of rail for renewal, for so many variables are involved that are not capable of expression in exact mathematical terms. It is true that rail wear or loss of section is a definite, tangible quantity, upon which certain fixed limits can be placed, but in determining what rails must be renewed there are other variables which must also be taken into consideration, among which may be mentioned the standard of maintenance, the speed of trains, the wheel loading, the weight of rail in track, the number of breakages, the density of traffic, etc. On many roads at the present time, unfortunately, the problem reduces itself to a compromise between established track standards and the funds available for the purchase and installation of new rails.

The first step in the making of a schedule of rail renewals for a season's work on most roads is the preparation of the recommendations of the local division officers for their respective territories. These recommendations are based on an intimate knowledge of the condition of the rail in track and of the service required of it. On the Canadian Pacific the division officers' requests for rail are subdivided under three heads, "Necessary," "Very desirable" and "Desirable." The general officer can thus see at a glance just what portions of the requisition are the least urgent.

These recommendations from the different divisions are assembled in the office of the chief engineer or the engineer, maintenance of way where they are studied and compared with rail charts and other data showing the age, location with respect to grade and curvature, the tonnage carried, the manufacturer, etc. On some roads the examination by the chief engineer goes no further than the inspection of these office records supplemented by such information as he may possess from his travel over the road. On other roads inspectors from his office examine all rail recommended for renewal before the recommendations are approved. On the Sante Fe a representative of the chief engineer takes a section of the rail and notes its general condition, the gage, the amount of expansion, etc. On still other roads the chief engineer or other officers in charge of maintenance, personally examines the rail recommended for removal. On the Norfolk & Western the assistant general manager follows this practice, while on the Chicago, Burlington & Quincy, the general inspector of permanent way makes a joint inspection with the assistant general manager and the local officers. Based on the information secured in this way the recommendations of the local officers are revised as may be advisable before approving them.

Such inspection seems to be necessary, in order to maintain a uniform standard over the entire road. The principal reason for this is to offset the personal equation in the preparation of the division reports. One division officer, realizing that his requisition will probably be reduced, will request more new rail than is actually necessary in order to get what he thinks is required, while another may request only what he thinks should be provided.

On the Lehigh Valley the engineer maintenance of way makes his recommendations concerning rail renewals only after frequent conference and inspection with the inspector of maintenance of way, division engineers and track supervisors. When this allotment has finally been determined a meeting of the division engineers is held in the office of the engineer maintenance of way at which a list of all materials needed is prepared and checked against the material on hand, after which the requisitions are made out for the additional material needed.

On the Chicago, Rock Island & Pacific, the program is reversed and the initial schedule of rail renewals is made out by the chief engineer and the assistant to the operating vice-president from records in their offices and from their knowledge of local conditions. This program is then sent to the two general managers with instructions to discuss it with their engineers maintenance of way, division superintendents and division engineers and to make such suggestions as they consider advisable. Any suggestions so made are investigated by the chief engineer or the assistant to the operating vice-president and such modifications made as seem desirable.

On the Delaware, Lackawanna & Western special attention is given to the heats in which large numbers of breakages have occurred, and all rails in such heats are removed from main track as soon as practicable. As it often happens that the rails of any one individual heat are widely scattered over different portions of a road, special attempts have been made on the Lackawanna to load all the rails of each heat together at the mill so that if it becomes necessary to remove any heat this can be done more readily. Also as different heats possess somewhat different physical qualities, more uniform wear can be secured by having the rails of one heat together, than by mixing soft and hard rails indiscriminately.

The recommendations of the division forces are commonly made in the fall and at least before January 1, to give the general offices opportunity to prepare their seasons program before work starts. As an exception to this practice the road masters of the Atchison, Topeka & Santa Fe prepare their recommendations for their division superintendents during March of each year, indicating the rail they desire for renewal during the following fiscal year. On the Lehigh Valley, where all rail is laid during the winter, the recommendations are prepared during the summer.

Requirements of Main and Branch Lines

As the amount of rail available for branch line use depends on the tonnage released from main line, it is generally necessary to consider the requirements of main and branch lines together. In many cases the demand for relaying rail on branch lines determines in large measure the tonnage of rail to be released from main line. This has been particularly true on a number of Western roads in recent years on which the operation of heavy locomotives has been extended very generally over the branch lines. After once being relaid with heavy rails a branch line ordinarily requires a less proportionate mileage of rail renewals than a main line, because of the smaller amount of traffic handled. Rail for side and yard tracks is also secured ordinarily from that released from main or branch lines. In some instances, however, as on the Louisville & Nashville, rail is occasionally purchased for use on branch lines, while on other roads, such as the Queen & Crescent which have small mileage of branch lines, rail released from main lines is sold.

Renewing Rail Out of Face Is Preferred

It is commonly agreed that it is advisable when renewing rail to relay it continuously in long stretches, as this gives uniform and better riding track than where the rail is relaid for short distances only, and the labor cost is less. A number of conditions interfere with the universal application of this method. In some cases roads in unfortunate financial circumstances find themselves compelled to renew only those rails which it would be unsafe to leave longer in the main

track. Rails on curves require renewal much more frequently than rails on tangent and on fast crooked track the wear is so rapid and irregular that it is frequently found impracticable to renew the rail out of face on tangent and curve alike. This is also the case where it has been found desirable to use special alloy steel on curves. On the Pennsylvania Lines it is common practice to renew rail through interlocking plants whenever the plants are being overhauled.

Owing to the desirability of making continuous renewals of rail it has become a rather general practice to do whatever patching is necessary with relayers to secure uniform track conditions and to make complete renewals when there is still considerable life left in a portion of the rails particularly on tangents, the best rails being reserved for relayers on main lines and those of poorer quality for use on branch lines. On some Eastern roads where especially high standards are required the released rails are used in the less important main line tracks. On the Pennsylvania Lines it is the practice when it is necessary to renew rails on freight running tracks to lay new rails on the adjoining passenger tracks and shift the slightly worn released rails over to the freight running track. While most roads use relayers for renewing on curves or other patching, the Norfolk & Western uses about 33 per cent. of its new rails for that purpose and the Missouri Pacific from 10 to 15 per cent.

Problems in the Re-use of Rails

A number of obstacles interfere with the successful use of the released rails in main line track in the condition in which they are released. Aside from the variation in the general condition of the rail the chief difficulty arises from the condition of the joints caused not only by battered ends but also from a failure of the rails to match properly at the joints, either through variation in tread or flange wear. A number of measures in common use to overcome these difficulties are: inspection and classification, resawing, rerolling, and a number of minor measures including the use of new joints, replacing the rails in the same position as in the track from which they were released, etc. Rails are usually inspected by the road master for the purpose of classification, with or without assistance or supervision on the part of other maintenance officers. Although, to secure uniformity, some roads employ a system inspector who classifies all rail released from track. This is usually done before the rail is loaded, and occasionally before it is taken out of the track. On the Union Pacific it is done at the various storage yards to which the rail is shipped as released from track.

The simplest and most common classification divides the rail into three classes, rail to be used in branch main line, rail to be used in side track and scrap. This classification is used by the Boston & Maine, the Louisville & Nashville, the Missouri Pacific, the Pennsylvania Railroad, the New York, New Haven & Hartford, the Seaboard Air Line and the Wabash. The Canadian Pacific uses four classes, namely, main line, branch line, side track and scrap.

On railroads which follow the practice of resawing and rerolling a considerable portion of the released rails, the classifications are complicated by the need of differentiating between rails requiring resawing and rerolling and those not requiring these operations. These classifications are founded on more or less definite rules based principally on the weight of rail and the relative proportion of the original section still remaining. Typical rules for classifications used on two railroads are given below:

Norfolk & Western

No. 2 Rails:
"2-A"—Full ball rails with tread worn not to exceed 1/16 in.
"2-B"—Side worn rails not to exceed ¼ in., with tread worn not to exceed 1/16 in.

No. 3 Rails:
"3-A"—Full ball rails with tread worn not to exceed ⅛ in.
"3-B"—Side worn rails not to exceed ¼ in. with tread worn not to exceed ⅛ in.

No. 4 Rails:
"4-A"—Full ball rails with tread worn not to exceed 3/16 in.
"4-B"—Side worn rails not to exceed ¼ in., with tread worn not to exceed 3/16 in.

Nashville, Chattanooga & St. Louis

First class relay rails.—All rails in this class are to be not less than 20 ft. in length and free from battered and split ends, overflow of metal and rust-eaten flanges, and to be practically straight in line and surface. No curve worn rails nor rails which are worn down exceeding ⅛ in. will be allowed in this class.

Second class relay rails.—All rails in this class are to be not less than 20 ft. in length, free from battered and split ends and are to be practically straight in line and surface. Rails which show curve wear exceeding ⅜ in., measured across the head at a point ½ in. down from the top, or which have an overflow of metal of more than ¼ in. will not be allowed in this class.

Side track rails.—Rails which do not conform to the foregoing specifications but which are not less than 15 ft. in length and good enough to be used in side tracks of any kind must be classified as side track rails. Second hand second quality or second hand special rails must be in this class.

Scrap rails.—Rails which are not suitable for private sidings or tracks seldom used, also all iron rails must be classified as scrap rail.

Resawing and Rerolling

The practice of sawing off the battered ends of rails is growing, although a number of roads, notably the Pennsylvania Railroad and the Pennsylvania Lines do not do this. On the other hand, the Michigan Central and the Norfolk & Western resaw all rail that is used again in main track, and the Chicago & North Western resaws about 75 per cent of the rail taken up. Other roads following this practice quite generally include the Union Pacific, the Illinois Central, and the Great Northern. The Missouri Pacific resaws only such rails as have split or broken ends, and which are therefore not returned to main track.

The resawing of rail is generally done at some central point where a permanent plant is provided for the purpose, as, for instance, at Jackson Junction, Mich., on the Michigan Central, and at Savanna, Ill., on the Chicago, Milwaukee & St. Paul. The Union Pacific has a portable plant mounted on a car which is shipped from one storage yard to another.

In order to secure the full benefits of resawing it is necessary that the rails match up well when placed in the track. To accomplish this successfully, it is necessary to caliper and match them accurately or, as practiced on some roads to limit the resawing to rails that have a reasonably good head.

The practice of rerolling worn rails has been followed to a limited extent for a number of years. The Pennsylvania Railroad and the New York, New Haven & Hartford discontinued the practice after trials, while the Chicago, Milwaukee & St. Paul follows this practice to a considerable extent. The Chicago & North Western also rerolls about 25 per cent of the rail released from track, while the Wabash and the Lackawanna have had a small amount rerolled. On the St. Paul rails of 85 lb. or heavier section, when released in sufficient quantities to justify, are rerolled. Most of this is 85-lb. rail which is rerolled to an equivalent of about a 75-lb. section. Formerly 75-lb. and 67-lb. rails released from track were rerolled, but this practice has been discontinued.

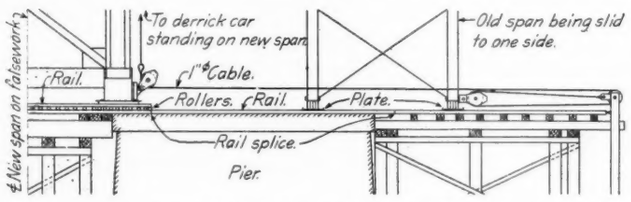
Other Methods

One method used successfully for matching relaid rails at joints is to number or match-mark the rails as they are released so that they can be relaid in exactly the same order. This method is used extensively by the Great Northern and the Nashville, Chattanooga & St. Louis. On the last mentioned road the rails are all numbered before being taken out of the track. Each mile is marked separately, the rail number, 1-R, 1-L, 2-R, 2-L, etc., being marked on each end of the rail and the mile number being placed near the middle. The high numbers must be loaded first. It has been found that the additional cost of loading by this method is small and the results obtained in the track are good. Another measure taken is to caliper the rails carefully. This is done on the Great Northern in all cases where the rails are not match-marked and relaid in order. The Burlington has a rule that rails relaid on main or branch line main track must not vary more than 1/16 in. in height. New joints are provided with all relaying rail returned to main tracks on many roads including the Illinois Central and the Pennsylvania Lines. The Chicago, Milwaukee & St. Paul also pays special attention to the straightening of rails at the time that they are resawed.

The Reconstruction of the Ohio Connecting Bridge

Interesting Methods Developed to Maintain Traffic During Erection of the Longest Riveted Simple Span

The reconstruction of the Ohio Connecting Railway bridge over the Ohio at Pittsburgh, which serves as a connection between the Pittsburgh, Cincinnati, Chicago & St. Louis on the south side of the river, and the Pittsburgh, Ft. Wayne & Chicago on the north side, involved the complete renewal of a number of large spans including one of 525 ft., with minimum interruption to a heavy transfer traffic. The problems imposed by these conditions were solved by the use of many unusual construction methods and interesting structural details.



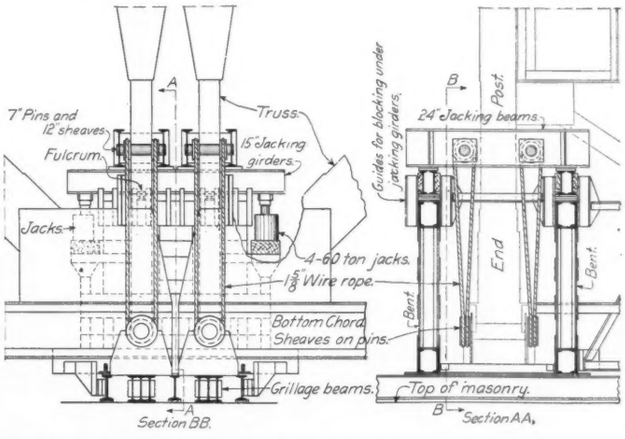
Arrangement for Sliding Out Old Deck Spans and Rolling in New Spans

The original bridge, built in 1889 and 1890 for single track was about 4,560 ft. long. A number of alterations and additions were made subsequently so that at the time of reconstruction the old bridge was made up of a variety of spans. There are wye-connections at each end so that the bridge proper serves as a neck between the two wyes. Beginning at the south end of the bridge, spans 1 and 1-A were pin-connected deck truss spans carrying the north and south wye-tracks respectively, which come together on span No. 2 and span No 2, rebuilt in 1901, was a double-track pin-connected deck span. Span No. 3 was a single-track 416-ft. through pin-connected span over the back channel. Spans 4 to 14, inclusive, were single-track pin-connected deck truss spans over Brunot's Island. Span No. 15 over the main channel of the Ohio, was a 525-ft. single-track through pin-connected truss span. Span No. 16, renewed in 1903, was a double-track pin-connected deck truss span serving as the junction of the east and west legs of the north wye. The west leg of the wye was a part of the original bridge, and consisted of a steel viaduct 1,300 ft. long. The east leg of the north wye was not built until 1903, and is a modern double-track structure requiring no alterations at the time of the present reconstruction.

The work recently completed was undertaken to replace all of the original superstructure with spans designed to take the modern heavy loading and to provide double tracks on the main bridge, the south wye and the west leg of the north wye. With the exception of a part of the west leg of the north wye, where extensive changes were made in the span lengths, the old masonry was found adequate for the support of the new superstructure upon the addition of metal grillages or other alterations of the copings. This article deals only with the reconstruction of spans 3 to 15, inclusive.

Brunot's Island Structure

The first work authorized was the renewal of spans 4 to 14, inclusive, on Brunot's island, which were replaced by double track riveted deck truss spans, 171 ft. long center to center of end bearings, 19½ ft. wide and 21 ft. deep, center to center of chords. There are two stringers per panel, supported on the top flanges of the floor beams with their top surfaces at the same elevation as the tops of the chords. Thus the ties of each track are carried on one stringer, and its corresponding top chord, these being connected by lateral bracing and cross frames. All 11 spans are identical, except that in the extreme ends of spans 4 and 14, the vertical end-posts

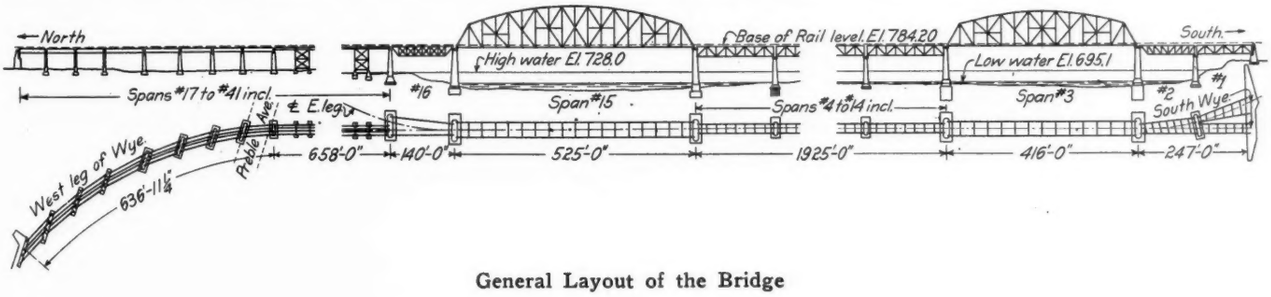


Jacking Frames for Lifting the Deck Spans While the Grillage Beams Are Being Placed

are omitted where these ends of the spans are supported in pockets in the piers supporting the adjacent through spans.

Because of the conditions imposed by the traffic requirements, the new spans were erected on falsework about 23 ft. down-stream from their final location. One at a time the old spans were then placed on rails and slid out on falsework on the upstream side and the corresponding new spans rolled into position.

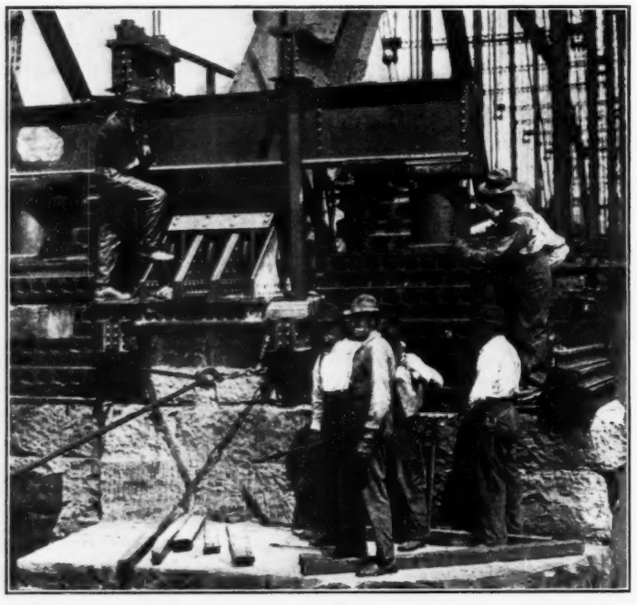
This scheme of lateral shifting could not be used for the new end spans 4 and 14, because their extreme end bearings are fitted into the pockets mentioned above. Consequently, the old spans were placed on falsework and the floor carried on pony bents and cut loose from the trusses which were dismantled and replaced by new trusses. The old floor was then



General Layout of the Bridge

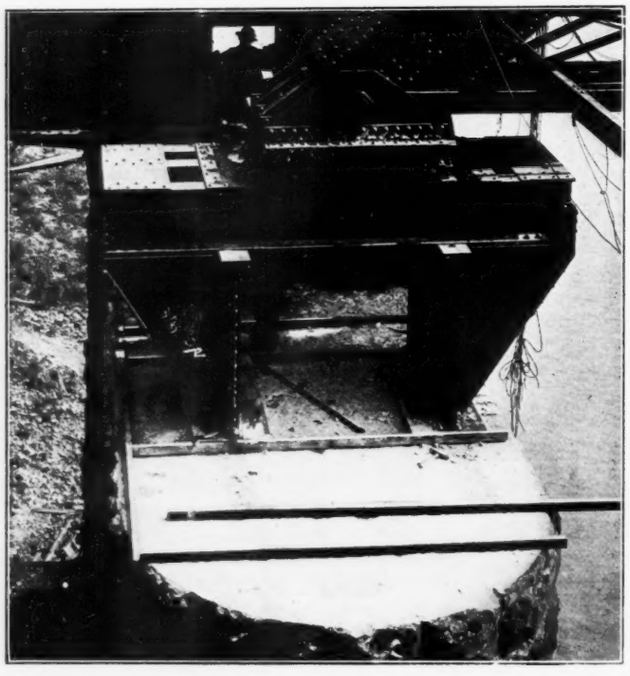
replaced by the new floor, panel for panel. All these operations were carried on from a temporary track on the down-stream side of the bridge.

The other nine spans were erected on falsework built on



Jacking Up Old Spans to Permit Removal of Stone Under the Old Shoe. The Pier Has Been Cut Down to Receive the Gallows Pedestals

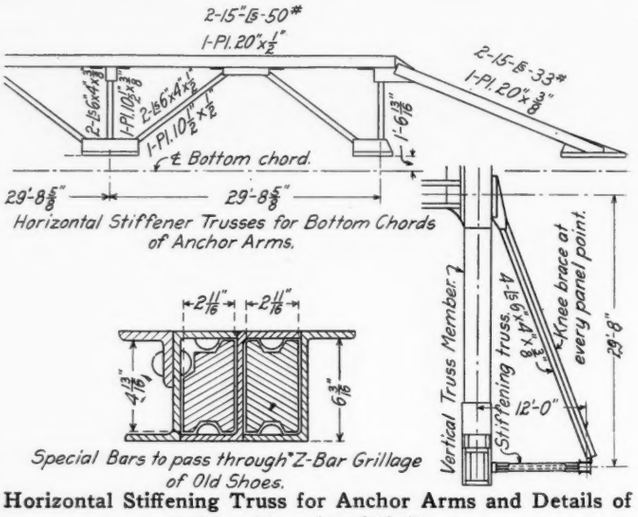
the down-stream side, the end bearings being carried on timber extensions of the piers, each of which consisted of seven frame bents supported on piles and carrying six 24-in. I-beams parallel to the center line of the pier. Blocking was



Old Spans Supported on Gallows Pedestals. Masonry Removed Ready for Placing the Three Inside Grillage Beams

placed on these to a level with the top of the pier. Rails and rollers were placed on this blocking and the truss shoes were set on them. The erection was handled by derrick cars on a track supported by the erection falsework, and the work was thus carried on entirely independent of the operating track.

The spans were moved on six lines of 85-lb. rail, using smooth lubricated plates sliding on the rails for the old spans and nests of 136 rollers 2½ in. in diameter for the new spans, the rollers being placed between the rails mentioned above and a second set of six rails under the shoes of the trusses. The power for moving the spans was supplied by two derrick cars, one standing on each end of the new span to be moved. The arrangement of the lines is shown in an accompanying drawing. A one-inch crucible steel rope was passed from the hoisting engine over the boom, down close to the vertical end posts and through the sheaves shown in the sketch. Structural steel beams braced against the ends of the piers served as the anchorage. It is readily seen that by first blocking the new span against movement the old span was forced to slide out, and then by securing the old span the new one was rolled in the same direction. The only delay between the two operations was while a section of roller nest was being placed on the lower rails in the space vacated by the old spans. The changing of each of the nine spans was carried out in every case without a hitch. The average in-



Horizontal Stiffening Truss for Anchor Arms and Details of Jacking Bars for Old Shoes

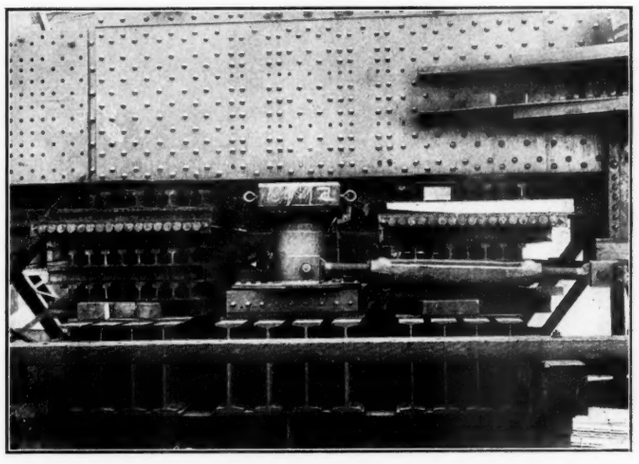
terruption to traffic for each shift was about 35 min., the minimum being 27 min.

After a span was rolled in it remained to replace the rails and rollers under the shoes with an I-beam grillage which covered the entire top of the pier. As the only space on the pier unoccupied by rails and rollers was a small area along the side and a 6-in. strip on the center line, the jacking up of the spans became an interesting problem, which was solved by the use of a rather ingenious jacking frame supported on I-beams placed in the narrow spaces available, until the rollers and rails were removed and replaced by a part of the grillage. The frame was then supported on the latter, while the remaining portions of the grillage were placed. Four 60-ton jacks were applied to one side of the frame at a time to lift the end of one span only, the other span being carried on fulcrums forming a part of the frame work, which were placed approximately at the same height as the top of the jacks. These jacking frames were designed by the engineers of the Seaboard Construction Company, who had the contract for the erection of the 11 deck spans. The steel for these spans was fabricated by the American Bridge Company. The erection was started June 30, 1913, and was completed on January 2, 1915.

The Two Channel Spans

The new spans 3 and 15, are through riveted spans 416 ft. and 525 ft. long, respectively, the latter being the longest riveted simple span on record. They were fabricated and

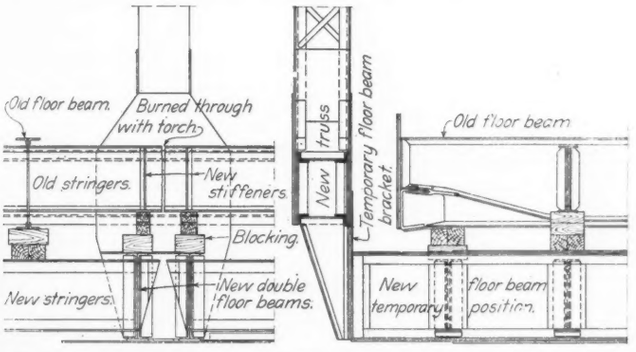
erected by the American Bridge Company concurrently with the other work on the bridge. The outline and general type of the two spans is the same and was governed by the conditions controlling the erection of the longer span over the main channel of the river. This program which was governed by the necessity for uninterrupted use of the track over the bridge and the desirability of avoiding falsework in the river, consisted in the erection of the span by the cantilever method from each pier, using one-half of the 416-ft. span as the anchor arm at each end with a sufficient quantity of rail and structural steel to serve as a counterweight.



500-Ton Jack Under the Rear of the Anchor Arm, for Adjusting the Elevation of the Cantilever Arm

The anchor arm structure was made identical at each end, but the falsework supporting it differed considerably on account of the complication caused on the west end by the presence of the junction of the wye within the anchor arm. This made it necessary to shift out the spans supporting the east and west legs of the wye at this point, carry the west leg on temporary girders, and put the east leg out of service until the anchor arm could be removed. At the east, or Brunot's Island end, the width of the anchor arm span allowed it to straddle the new deck span No. 14 without interference. The extreme ends of both anchor arms were carried by temporary steel towers, and at their inner or pier ends by special girders spanning from the piers to timber bents.

Before commencing the erection it was necessary to place grillages consisting of seven girders 3 ft. 2 in. deep on the tops of the two piers, practically covering them. To accomplish this the top course of masonry was removed, except the single stone about 2 ft. deep under each shoe. The next two courses of masonry down to the elevation of the bottom of the grillage were also removed, except a rib along the longitudinal axis of the pier of the same width as the top stone under the shoe. This rib was then used as a support for a jacking rig by means of which a 500-ton hydraulic jack on either side of the shoe lifted the old span and its shoe

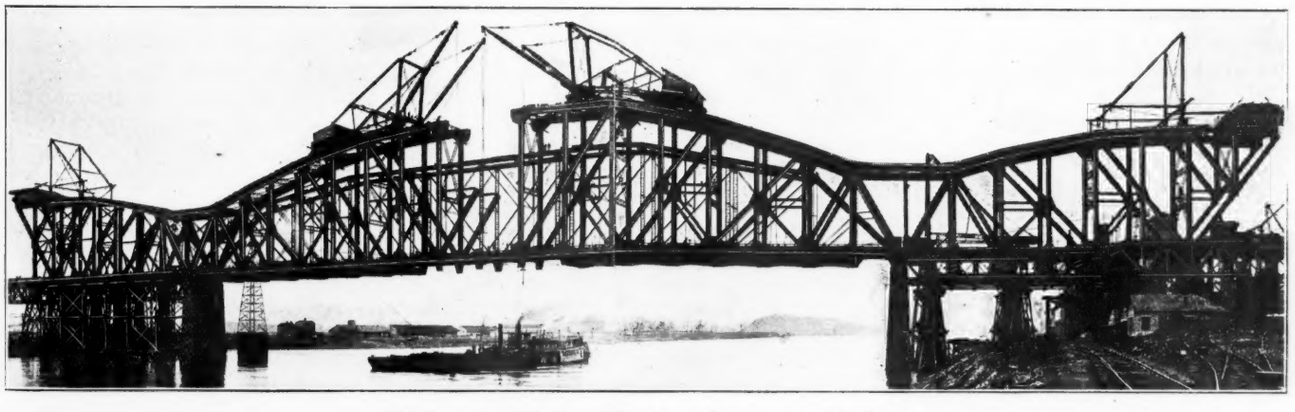


Method of Supporting Old Floor on the New Floor While in the Temporary Position

clear of the top course stone as shown in one of the accompanying photographs. The lifting force was applied by means of specially planed bars inserted through a Z-bar grillage, which formed a part of the old shoe. Through the space vacated by removing the stone under the shoe, the beams of a structural steel gallows pedestal were inserted, by means of which the old shoe was supported clear of the rib of masonry on which the jacks rested. This rib was then removed as shown in another photograph and three of the seven grillage girders were placed in the opening underneath the gallows pedestal. The pedestal was then blocked up on these grillage girders, the cross beams of the pedestal were burned off flush with the edge of the shoe with an oxy-acetylene flame and all of the pedestal was removed except that directly under the shoe. The remaining four grillage girders were then placed, two on each side, after which the grillage diaphragms were riveted up and the operation was complete.

Each cantilever arm and its corresponding anchor arm were erected by a creeper traveler running on standard gage tracks on the top chords and erection ties. The travelers were equipped with 50-ft. booms on each end, the rear booms being used for the erection and dismantling of the anchor arms and the forward booms for the erection of the cantilever arms. Only one set of booms, however, was mounted at a time.

Owing to the location of the anchor arms astride of the existing track and structures supporting it, it was impossible to use the bottom lateral bracing of the truss. To compensate for the absence of this, a horizontal stiffening truss was added on the outside of each bottom chord of the anchor arms.



Placing the Closing Members in the 525-ft. Span

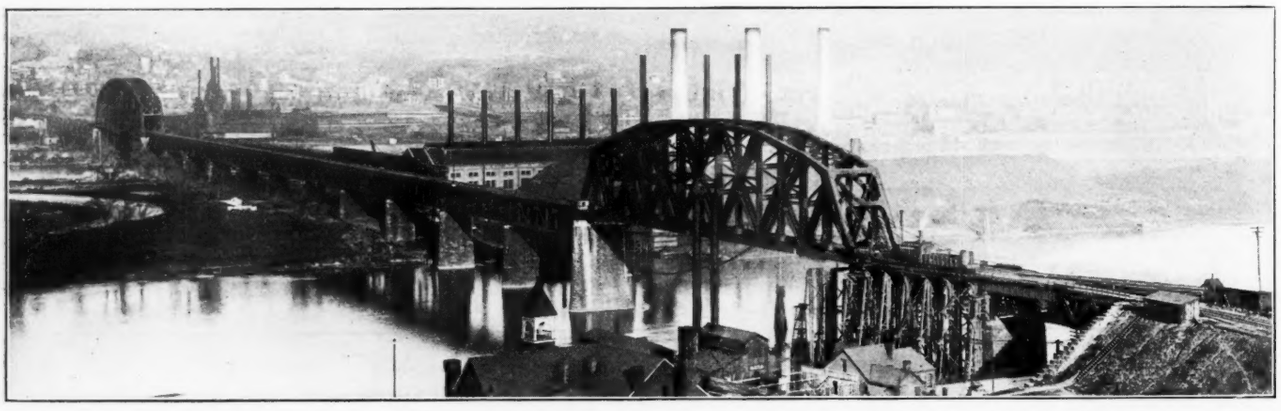
This is illustrated in one of the accompanying drawings. No riveting was done on the anchor arms or the horizontal trusses, the members being connected by pins and bolts only. The placing of the pier grillages, the erection of the anchor arms and the placing of the counterweight comprised the most complex and slowest part of the work. It was begun on April 20, 1914, and was completed January 11, 1915.

In erecting the cantilever arms, the material was delivered on barges from a material yard located one mile down stream. The erection progressed very rapidly and it was only four weeks between the setting of the first members and the closing of the span. A record was attained in the erection of 1,160 tons of steel in a single week, the time actually consumed in erecting being only 16 hours, the remainder of the time being taken up in moving the travelers, etc. The positions of the ends of the cantilever were controlled vertically by two 500-ton hydraulic jacks under each truss of each anchor arm. The closing of the top chord was accomplished by adjusting the elevation of these jacks to give the desired opening for the closing section.

To facilitate supporting the old span during dismantling, the floor system of the new span was suspended temporarily below the bottom chords entirely under the old span by temporary brackets. Another innovation was to provide two floor beams at each panel point, whereby the floor system for each panel was entirely independent of the floor of adjacent panels and could therefore be erected, raised or lowered independently. As soon as the new span was erected complete the old trusses were burned apart with oxy-acetylene torches and loaded on cars, leaving the old floor blocked up on the new one and carrying traffic. The new floor system was then raised to a permanent position, panel by panel, beginning at one end of the span. As the panels in the old and new floor systems did not coincide, the old stringers were burned off at points coinciding with the panel points of the new system, temporary stiffeners having been riveted to the old stringers at these points previously so that they could be blocked up on the new floor beams. Traffic was interrupted only during the time required to remove the section of the old floor system and raise the new floor panel into position. This interval averaged about 40 min. per panel. Work was begun on span No. 15 on April 20, 1914, and the erection was finished on June 20, 1915.

The erection of span 3 over the back channel of the Ohio river was carried on by a much simpler program. As there was no river traffic, falsework was feasible for taking down the old span and erecting the new one. In addition a single-track runaround was built to take care of traffic during erection. The steel work for the new span was erected by 60-ton locomotive cranes, 85-ft. booms being necessary for the setting of the middle top chord sections. The material was delivered by rail.

The general design, plans, etc., for the entire bridge were worked out in the offices of the engineering department of the Pennsylvania Lines under the direction of Thomas Rodd, chief engineer, and J. C. Bland, engineer of bridges, to whom we are indebted for the information given above.



View of the Completed Bridge from the South End, 416-ft. Back Channel Span in the Foreground

ECONOMICS OF CURVE LOCATION WITH PARTICULAR REFERENCE TO OPERATING ADVANTAGES

By W. F. Rench

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Generally speaking, there are but two divisions of railways —main lines to be operated at the now almost universal maximum limit of 70 miles per hour, and branch lines to be operated at the commonly prescribed maximum of 40 miles per hour. Upon the former the passenger traffic is usually predominant; upon the latter, freight traffic. When the main line is burdened with a considerable freight traffic it is the rule for this traffic to be carried upon definitely assigned tracks and since these tracks may frequently be required for passenger movement their adjustment must be co-ordinated with the average of the two speeds, or say 55 miles per hour. It is now fully recognized that enginemen cannot regulate their speed closer than 10 per cent, except when speed indicators are provided, and that even with faithful maintenance, depressions of ¼ in. in main lines and of ½ in. in branch lines and similar variations of alinement are unavoidable. These may therefore be considered the working limits of speed for the purpose of this discussion.

One of the most common errors in past location of main lines has been the endeavor to attain too light a degree of curvature. Thus, 10-min. curves are sometimes used, 15 min. are not unusual and 20 min. quite common. Experience has shown that a measurable increase in cost of maintenance attaches to such selections. The degree of curve may be considered as the number of inches a joint deflects from a chord held to contact at the two adjacent joints. The exact length of such a chord is 61 ft. 8 in. but the proposition will serve for illustration. For a 15 min. curve the deflection would be ¼ in. Such a curve would theoretically require a superelevation of ¾ in. If a joint on the high side should become ¼ in. low and through this cause shift outward ¼ in., as quite probably would be the fact, there would result a curvature twice as sharp as the normal degree or 30 min. and the superelevation of ½ in. would be wholly inadequate since such a condition would require 2 in. This disadvantage is partly overcome by employing a superelevation somewhat greater than that determined by the theoretical formula of mechanics, as, for example, a practical superelevation of 1½ in. is used

for a 20-min. curve, although theoretically no more than 1 in. is necessary.

If, however, the curve were 45 min. and the same errors should enter, the curvature would become 1 deg. and if the proper superelevation of 2½ in. had been used, the 2¼ in. obtaining would still be sufficient for the increased curvature. A curve of this degree may therefore be considered the ideal one and both theory and practice will indicate that the desirable limits for the lighter curves is between 30 min. and 1 deg., with even closer limits between 40 min. and 50 min. to be preferred.

The maximum limit of curvature for important main lines to be operated without speed reduction is 2 deg. 30 min., which requires 5 in. superelevation. This amount should be fixed as the limit of superelevation for high speed tracks, not because any more is unsafe, but by reason of the discomfort which results when a slower speed is used. If the speed should become less than 35 miles per hour at such a point the disadvantage in this respect would be quite marked and the destructive effect would be greater as the speed was further reduced.

The determination of the practical limits for branch line location is made similarly and these are in general three times those for main lines, or between 1 deg. 30 min. and 7 deg. The proper superelevation for a 45-min. curve at an authorized speed of 40 miles per hour is 1 in. If this should become 1½ in. through the low side settling and the curvature thereby become as light as 15 min. a speed of 70 miles per hour would be required for comfort and if by the high side settling it should become as little as ½ in. and the curvature as sharp as 1 deg. 15 min., no more than 30 miles per hour would be permissible. In the case of the 1 deg. 30 min. curve, however, requiring 1½ in. superelevation, a sharpening of the curve to 2 deg. by reason of the superelevation diminishing to 1 in. would not render the conditions unfavorable and a flattening of the curve to 1 deg. with the superelevation increased to 2 in. would not introduce any element of discomfort.

As regards the maximum limit of 7 deg. for which a superelevation of 5½ in. would be necessary where maintenance was of medium character, both to provide for natural deficiencies of line and surface and to allow for a 10 per cent increase of speed, this limit is based mainly upon a practical knowledge that superelevation in excess of this figure is undesirable if not actually improper. When maintenance is of the best a curve as sharp as 8 deg. may be operated at a speed of 40 miles per hour; but a safer practice would be to restrict the speed to 35 miles per hour, for which the limiting superelevation of 5½ in. would then be correct.

Another error in curve location, causing a serious disadvantage in maintenance that is reflected in operation, is the placing of a grade intersection at the end of a curve. This is especially troublesome upon lines of undulating profile and numerous curves and these features usually occur together. The problems of the easement and of the vertical curve are simple enough when considered separately, but when they are in combination a question results which is much too complicated for any but the accomplished physicist. While it is possible to effect a practical adjustment of such conditions, the future maintenance will severly try the ability of the most expert track foreman. It is a matter of experience that no greater disadvantage to the riding qualities of a track can be found than a dip in the grade just at the end of a curve and the same fact holds true of a summit. It requires some sacrifice to adjust the line or the profile so that the two features will be separated, but the advantages in maintenance which result fully justify the correction. This qestion is of timely interest because of the tendency in making a compensation of the gradient for curvature to introduce the change exactly at the ends of the curve which in the process of refined adjustment become the center of the easement and the error is thus cumulative.

When curves are provided with proper easements there is theoretically no need for any tangent between the curves, but with a due regard for the esthetic requirement and economically because it provides for the addition of siding connections under more favorable conditions, tangents should be provided at proper intervals. The minimum length to satisfy both needs would be 400 ft.

In view of the great importance of clearance not only at the side but between adjoining train movements it becomes quite essential that a factor be designed for widening the track centers on curves. Three elements enter into the question, viz.: the design of the equipment, the relative superelevation of the several tracks and the degree of maintenance. The maximum truck centers may be assumed as the equivalent in length of the chord which furnishes a middle ordinate in inches equal to the degree of curve. The overhang at the end is generally the same as that at the middle and as these two combine to decrease the clearance, it may be stated that ideally the correction should be 2 in. per degree. When adjoining tracks are operated at different maximum speeds requiring difference in superelevation there should be a further allowance of three times this difference. If maintenance is good the extreme allowance for swaying might safely be made 1 in.; if only fair, as much as 2 in. would be required. Thus, a well maintained main line curve of 2 deg. 30 min. with inner tracks operated at 60 and outer tracks at 70 miles per hour would require a correction of 10½ in. in the track centers. Clearly the tracks could not be made parallel throughout as this would require a reverse at the ends. The proper solution of such a case would be to adjust the difference through the respective easements of the several tracks.

With the advent of the high island platform for passenger service a nice problem in curve economics is presented for solution. This structure is almost certain to occur either wholly or in part upon curves. It is, of course, essential that a uniform opening be established and maintained between the car and the platform. To attain this with the platform alined upon a regular curvature ending in the tangents requires that a reverse be introduced into the track curve which is not only unesthetic but disadvantageous. The importance of this will be fully appreciated when it is considered that the difference in distance of track from platform for a 2-deg. 30-min. curve with 1 in. superelevation for operation at 30 miles per hour would be 3½ in. Such protrusion would unquestionably cause a very deficient alinement. The trouble will be entirely avoided by introducing proper easement curves into the platform alinement as well as that of the track.

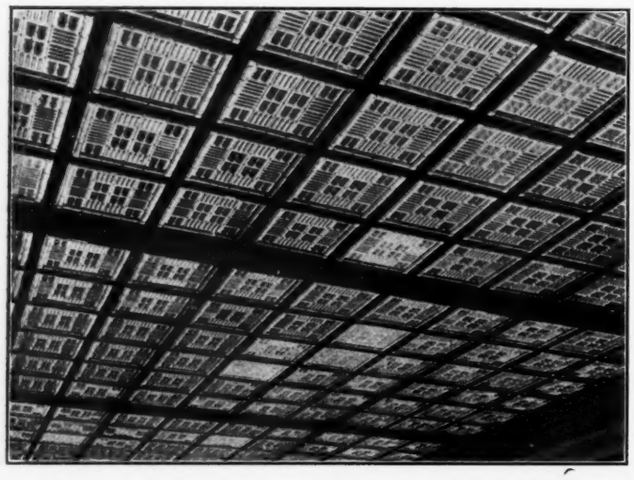
GLASS CONSTRUCTION FOR HEAVY SERVICE

An interesting form of glass construction has been introduced recently into this country by the Keppler Glass Constructions, Inc., New York City, for use in roofs, skylights, windows, partitions and ceilings. The applications have extensive variations, but the idea is the same in each case and involves the use of square blocks of pressed glass supported by ribs of reinforced concrete, one or both of the exposed faces of the glass having irregular surfaces, with the result that although the glass is clear the light is diffused in transmission, producing a translucent effect. Another distinctive feature is the channeling or grooving of the four sides of the blocks, whereby the supporting ribs are partially or entirely enclosed by the glass, as a result of which the glass surfaces are practically continuous on one or both sides. Owing to the diffusion of the light the ribs supporting the glass are revealed only indistinctly by shadows, giving very much the appearance of a continuous glass structure.

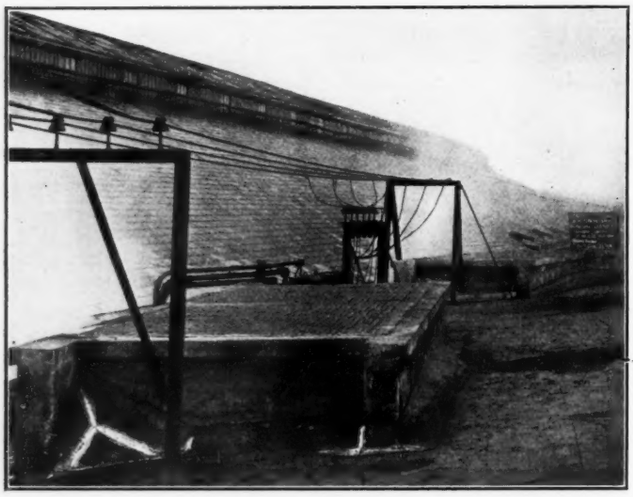
Glass units of plain design are provided for use in industrial buildings, but where appearance is of importance, a variety of appropriate designs are available. The units are furnished in clear glass or in a golden amber.

The arrangement of the glass blocks in the typical floor or pavement construction is shown in the accompanying photographs. The glass blocks vary from 3½ in. to 6 in. in size with thicknesses to correspond. The strength of the floor is modified as required by the service and can readily be made strong enough to carry the loads obtained by trucking on station platforms.

The glass is annealed to eliminate internal stresses and is examined with a polariscope to insure this being done properly. The reinforced concrete is made of one part of slow-setting Portland cement and two parts of sand. Expansion and contraction are taken care of by an elastic light-reflecting cushion around each unit and an open joint of 1/12 in. between the blocks on the under side. Expansion joints are also provided in the floor slabs at suitable intervals. The completed work is covered with wet sand for several days to prevent drying out before thorough setting has taken place. This construction is waterproof and highly fire resistant.



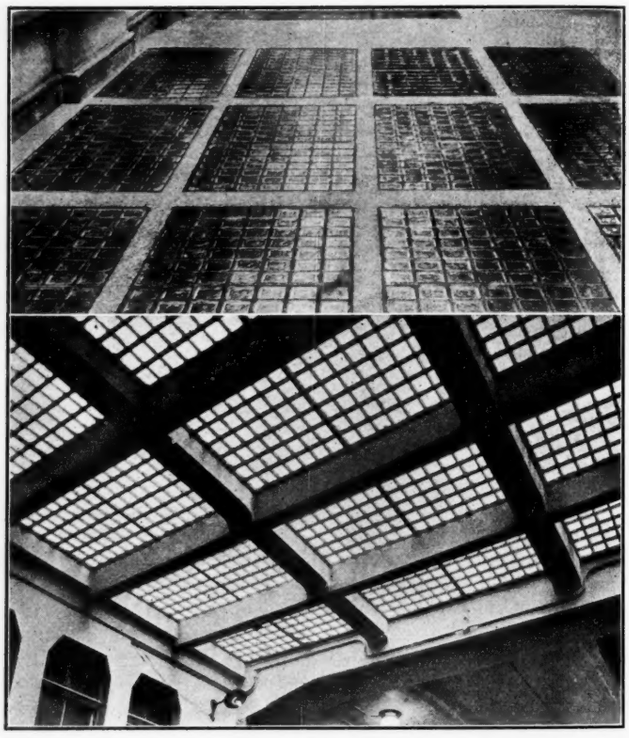
Ornamental Glass Ceiling in a Railway Station at Metz, Germany



Raised Roof Lights in the Lehigh Valley Roundhouse at Sayre, Pa.

The glass partitions are of similar construction except that the glass sections are lighter as less strength is required and the supporting ribs are completely enclosed on both sides. In the glass ceilings the units are supported by copper ribs or in the case of long spans small structural steel T or I-beams are worked into the design. The copper glazed panels are completed in the factory and installed on the steel or reinforced concrete roof framing. The distinguishing feature of these ceilings is their substantial structural appearance. While in many ornamental glass ceilings there is a tendency toward a flimsy appearance, out of harmony with substantial architecture, the Keppler ceiling lights are made up of glass units, ornamented in relief which carry out the general architectural style of the room. In this way a break in appearance is avoided between the glass ceiling and the rest of the architecture. These ceilings lend themselves readily to ornamental treatment and are adaptable to all kinds of construction.

The Keppler glass construction has had extensive use throughout Europe and has recently been installed in buildings in America. Recent railroad installations include 50,000 sq. ft. of skylights in the Bush train shed for the Lehigh Valley passenger station at Buffalo, and for the Lehigh Valley roundhouse at Sayre, Pa. Contracts have also been let for installations in the Lackawanna station at Buffalo and the Pennsylvania station at Johnstown, Pa.



Bottom and Top Views of an Installation of Lights in a Trucking Platform of a Railway Station at Chemnitz, Germany

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AN ACTIVE "BUREAU."—The officer of the freight department of the Pennsylvania Railroad who at the beginning of the present extraordinary congestion was stationed at New York to give special attention to moving blockaded cars and to answering consignees' inquiries is still "on the job," and has 25 assistants at work. Starting with a half dozen men, this "bureau" thus at present has 26. They sit all day at a large round table in a room in the Pennsylvania Station and keep ten telephone lines busy. They answer questions, locate, and "order in" cars, give information to and make arrangements with shippers, consignees, steamship agents, and the representatives of the many foreign governments for which a very large proportion of the congested export freight is destined. The work is done under the supervision of the division freight agent in New York.

Determining the Proper Length of Track Wrenches*

A Description of Test Made to Ascertain the Safe Leverage Which May Be Applied to Joint Bolts

By Earl Stimson

Engineer Maintenance of Way, Baltimore & Ohio

With the introduction and extensive use of track bolts of larger diameter, and of bolts made of high tensile steels, the necessity of a greater length of track wrench became apparent. This led to some experiments to develop the maximum length of wrench for practical and safe use with bolts of different diameters and tensile strengths.

Two tests were made: First, using standard 1 in. by 4¾ in. carbon steel bolts with Harvey grip threads and hexagonal nuts, and second, using 1 in. by 4¾ in. heat-treated alloy steel bolts with U. S. standard threads and hexagonal nuts. A Rhiele screw gear 100,000-lb. testing machine was used with apparatus designed especially for testing bolts. The bolt was suspended from the top of the machine with the nut on the under side of the movable head using a bearing plate and spring washer and getting a full thread in the nut. The nut was then at a height to enable a man to get a horizontal pull at his waist line. A trackman weighing 150 lb. was given a wrench and directed to tighten the nut as he would in track, the loads being observed on the scale beam. After he had drawn the nut tight, the load on the bolt as registered on the beam was recorded. The machine was then started on slow motion, about ½ in. per minute, until the elastic limit was reached. This being read and recorded, the machine was run to the ultimate strength of the bolt. A repetition of this test was made, using wrenches 30, 36, 42 and 48 in. in length. The results were then tabulated to show the relation between the load on the bolt when pulled tight with the different wrenches and the load at the elastic limit of the bolt.

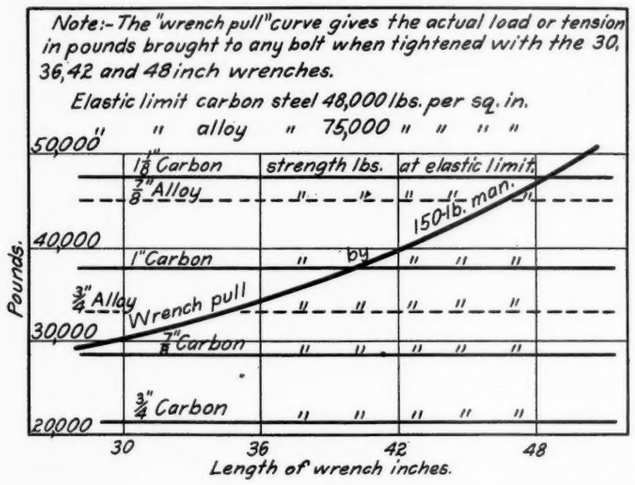


Diagram No. 1. Relation Between the Loads Pulled with Wrenches and the Actual Elastic Limits of Bolts

It was intended to make the conditions of the test as nearly as possible identical with actual conditions met with in maintaining track. It was difficult, however, to arrange the apparatus so as to get a pull on the wrench in a vertical plane and at the same time measure the loads accurately. The arrangement enabled the trackman to throw his entire weight on the wrench, giving it about the same jerk or impulse it receives in actual practice. No attempt was made to obtain uniformity of load with the same length of wrench; the trackman used his own judgment in determining when the nuts were tight. The loads on the bolts, therefore, when the nuts were pulled up tight, were shown to vary as much as 8,000 lb. for the same length of wrench.

In the run of the kegs the carbon steel bolts averaged 0.995 in. in diameter, while the heat-treated alloy steel bolts ran about 0.933 in. in diameter. A comparison of the chemical and physical properties of the two bolts is given in Tables 1 and 2.

TABLE 1—COMPARATIVE CHEMICAL ANALYSIS

Elements	Carbon Steel Bolts Per Cent	Carbon Steel Nuts Per Cent	Alloy Steel Bolts Per Cent	Alloy Steel Nuts Per Cent
Carbon	0.20	0.12	0.19	0.17
Sulphur	0.031	0.09	0.037	0.08
Phosphorus	0.008	0.110	0.01	0.073
Manganese	0.50	0.37	0.71	0.60
Chromium	....	....	0.14	0.08
Nickel	....	....	1.09	0.41

TABLE 2—COMPARATIVE PHYSICAL PROPERTIES OF BOLTS TESTED

	Carbon Steel	Alloy Steel
Reduction, per cent	46.7	30.5
Elongation, per cent in 4¾ in	15.3	7.8
Elastic limit, lbs. per sq. in	49,109	93,225
Ultimate strength per sq. in	59,704	104,793

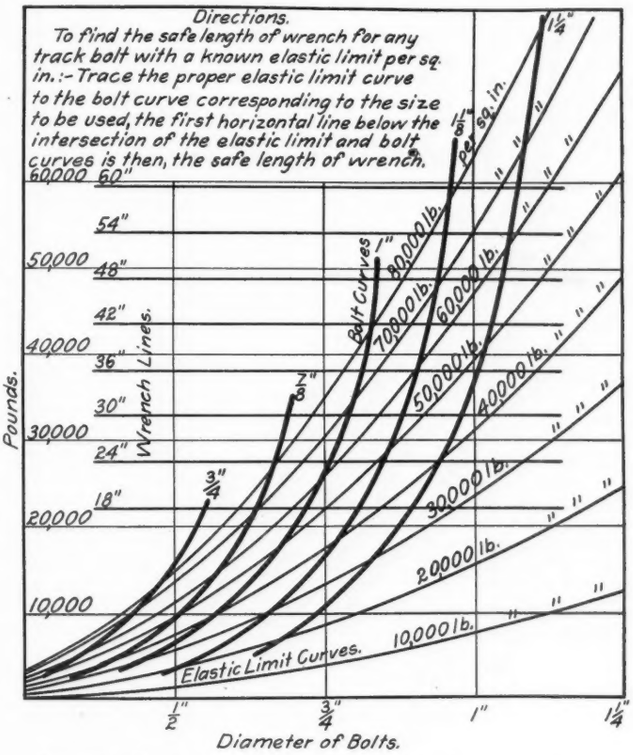


Diagram No. 2. For Determining the Safe Length of Track Wrenches.

The object of the tests was to show the relation between the loads on the bolts when drawn up tight with various length wrenches and the elastic limit of the bolts. The averages of a series of tests with carbon steel bolts showed the loads

*Abstracted from Bulletin No. 180, American Railway Engineering Association.

pulled with 30 and 36-in. wrenches well within their elastic limit, while the load pulled with the 42-in. wrench exceeded the elastic limit. The load pulled with the 48-in. wrench was less than that pulled with the 42-in. wrench, and was also less than the elastic limit of the bolt. The increment of load should be expected to vary with the length of wrench. In running this test, however, the jaws of the 42-in. and 48-in. wrenches became so badly sprung that the nuts rounded so as to prevent pulling them up tight. The 48-in. wrench was redressed and tempered and another series of tests made. Again its jaws sprung, and so damaged the nut that further tightening was impossible.

With the carbon steel bolts and hexagonal nuts, therefore, the use of a wrench greater than 36 in. in length not only involves the risk of stretching the bolts beyond their elastic limit, but so injures the nuts as to necessitate cutting them in order that they may be removed.

Trouble with the wrenches spreading was not experienced with the alloy steel bolts. After a second dressing and tempering of the same wrenches used with the carbon steel bolts, a much greater load was pulled, using alloy steel bolts, without injuring the nuts. The need of a harder steel nut is emphasized by the damage done with long wrenches while tightening the carbon steel bolts. It will be seen from Table 3 that slightly greater loads were pulled with the same length of wrench with the alloy bolts than with the carbon bolts, while the damage done to the nuts was much less with the alloy steel than with the carbon steel.

TABLE 3

Length of Wrench	Load when pulled tight	
	Carbon Bolt	Alloy Bolt
30-in.	25,783	28,757
36-in.	28,333	30,837
42-in.	38,617	33,673
48-in.	31,530	43,050

The loads which were registered when the nuts were pulled up tight vary considerably. Several factors account for this variation. In the first place, it was left entirely to the trackman pulling the wrench to determine when he had the nuts tight; second, the damage done by the wrench to some of the nuts was greater than to others, making it impossible for the trackman to draw all of them up the full amount; third, the Harvey grip thread on the carbon bolts pulled much harder than the U. S. standard thread on the alloy bolts.

Even with such irregularities in results, the data obtained enables the establishment of a safe limit to the length of wrenches for use with bolts having different tensile strengths. Diagram 1 gives the average load in pounds pulled by the 150-lb. trackman, using four wrenches varying in length from 30 in. to 48 in., together with the actual strength in pounds of both carbon steel and alloy steel bolts varying in diameter from ¾ in. to 1¼ in. The "wrench-pull" curve is the maximum load registered when the nuts were pulled tight with each wrench. The strength of the bolts is calculated on the basis of minimum allowable elastic limit of the steel, namely, 48,000 lb. per sq. in. for carbon and 75,000 lb. per sq. in. for alloy steel. Thus the diagram indicates the length of wrench required to tighten the various bolts to their capacity. It should be remembered, however, that the "wrench-pull" curve represents the loads that can be brought to the bolts by a 150-lb. man and not the maximum loads that can be pulled. A heavier and stronger man could probably exert a much greater pull. It is felt, however, since the curve represents the maximum pull registered where both the Harvey grip and U. S. standard threads were tested, that the loads would seldom be exceeded in actual track maintenance.

Having found the amount of strain that can be brought to a bolt with the different lengths of wrenches, the question arises as to the limit in length of wrenches for practical use. In setting the maximum limit, two questions should be considered, namely, the size and weight for convenient handling by one man, and the length giving sufficient leverage to permit a man of average strength properly to tighten track bolts. A 40-in. wrench weighs 8½ lb. and, for 1-in. bolts, seems to meet with universal favor among trackmen. Whether 40 in. gives sufficient leverage requires the determination of the load transmitted through the rail joint into the bolts. To secure the greatest efficiency in the rail joint, it is essential that the splices be held together rigidly. Undoubtedly the maximum condition is when the two middle bolts are the tightest. Taking for example an axle load of 64,000 lb., one wheel would impact to the rail joint a static load of 32,000 lb. Assuming that the effect of impact adds 200 per cent to the static load, there would be 96,000 lb. coming to the rail joint. Each of these two middle bolts would then receive one-half the horizontal component of 96,000 lb. acting upon the wedging surface of the splice bars, namely, 21,043 lbs.

Therefore, to take care of the loads coming to a joint, the bolts should be tightened at least to a tension of 21,043 lb. When a bolt has been wrenched up to 21,000-lb. tension and subsequently receives a strain of 21,000 lb. from rolling loads, it must withstand a total of 42,000 lb. tension.

Referring now to the "wrench-pull" curve, Diagram 1, it will be seen that 38,000 lb. can be pulled with a 40-in. wrench, so that it seems advisable to set the maximum allowable length of track wrench for 1-in. high-tension bolts at 40 in.

On the basis of the assumption that the permissible amount of tightening depends on the elastic limit of the bolt in question, and the tension brought to the bolt by the load and impact of a maximum axle loading, Diagram 2 has been prepared giving the safe length of track wrench for use with bolts having a known minimum elastic limit per square inch. In other words, it gives the length of wrench required to bring a tension to each sized bolt not to exceed the actual elastic limit of the bolt less the load or strain brought to the bolt by the rolling load.

The lengths derived in this way appear to be less than the lengths commonly used for track wrenches, yet the results of the experiments are considered with the belief that much of the unsatisfactory service of track bolts comes from overtaxing their strength, turning them up so tight that they stretch under the combined rolling loads and wrench loads. It seems advisable, therefore, so to regulate the length of wrenches that such injury cannot be done to the bolts under normal working conditions, and Diagram 2 is exhibited as a guide in determining the safe and practical lengths to be used.

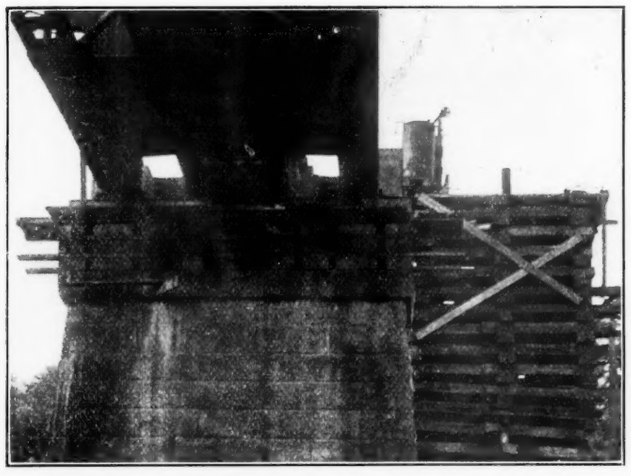
RAISING A THREE-SPAN BRIDGE UNDER TRAFFIC

A revision of the facilities at Kiskiminetas Junction on the Pennsylvania Railroad, where the main line of the Allegheny division crosses the main line of the Conemaugh division at grade, involved a raise, in the Allegheny divison's bridge over the Kiskiminetas river, of 7 ft. at one end of the structure and 5½ ft. at the other. The bridge consists of three single-track, pin-connected, through truss spans of about 240 ft. each, resting on masonry piers and abutments with the base of rail 45 ft. above water. The two main tracks of the Allegheny division are gauntleted over the bridge and carry a heavy through freight and passenger traffic between Pittsburgh, Oil City and Buffalo.

Stone masonry U-abutments were raised to the new elevation in a simple manner, since they were of sufficient width to allow the side walls to be carried up in concrete without interference. The back-walls of the abutments could not be built until after the bridge had been raised to its new elevation. Means were provided for taking care of the fill

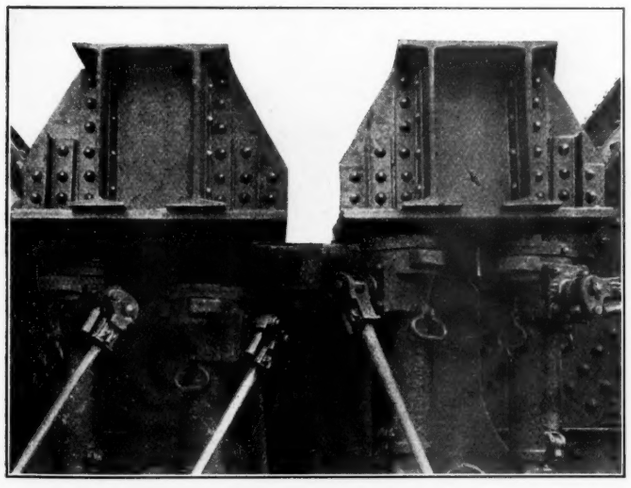
by using 12-in. by 12 in. timbers placed as a temporary back-wall as the track was raised. These timbers were used as a back form to mould the concrete back-wall when the raise was completed.

On account of the necessity of maintaining unobstructed freight and passenger traffic during the operation, the raising of the three spans of the superstructure presented many difficulties. After considering various schemes it was decided to raise the load by means of jacking beams carried over each shoe by eye-bars, attached to the end pins. The jacking



Blocking in Position on One of the Piers

beams consisted of two 18-in. I-beams provided with stiffening brackets and connected by cover plates. The eye-bars consisted of 6 in. by 1¾ in. bars, with one eye, forged to 4¼ in. bolts provided with hexagonal nuts. The beams were long enough to permit two jacks to be placed under each end and then carry on the jacking operation from the tops of the piers, without the use of false work other than blocking. Since the pins did not project sufficiently to receive an eye-bar, the nuts were removed from each end and replaced with

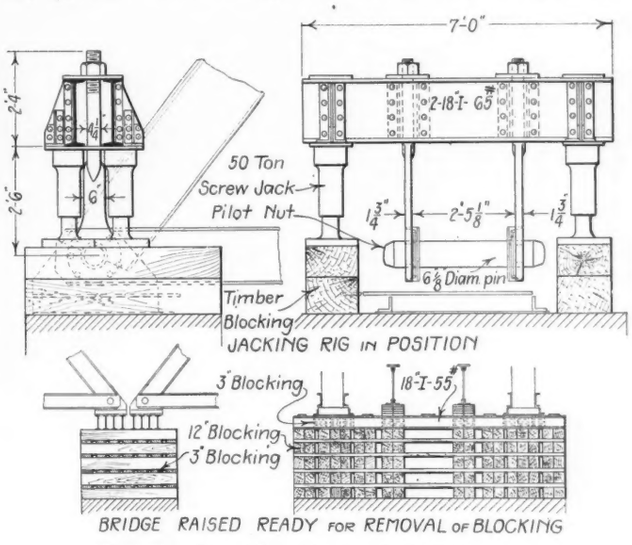


Jacking Rig in Position

pilot nuts, over which the eye-bars were slipped. It was calculated that each shoe had a dead load of 190,000 lb., but to provide against emergency four 50-ton ratchet screw jacks were used, two under each end of the jacking beams. Two men were employed to operate the handles on each jack, and movement was made in unison on signal from a man designated for that purpose.

To accomplish the work, six jacking beams, each with a pair of eye-bars, were provided to eliminate as much as possible the necessity for moving the device from one pier or abutment to the other as the work progressed. A beam was placed over each shoe on an abutment and kept there until it was necessary to move to the extreme end of the bridge. The other four beams were moved back and forth from one pier to the other as required. The work of raising was begun at one end and was carried up on the initial lift to a height of 16 in. The end of each span resting on the next pier was carried up a corresponding height. In order to avoid excessive grades in the spans, and to eliminate any possibility of an end movement, work progressed back and forth in this manner until the required height was reached.

The blocking to support the bridge structure under train load, and for the jacks in the raising operation, consisted of 12 in. by 12 in. oak timbers of a length corresponding to the width of the pier or abutment seat sawed true to size and laid parallel to the axis of the bridge, alternating with 3 in. by 12 in. plank which were laid at right angles to tie the blocking together. As the bridge was raised, wooden wedges were



Details of Jacking Rig and the Blocking

inserted under the shoe and kept driven tight as the work progressed. When the shoe was high enough, these wedges were replaced with 3 in. by 12 in. plank, three in width under each shoe and with a four-foot length parallel to the axis of the bridge. This method was followed to a height of 16 in., when one width of plank blocking was removed from under each shoe and replaced with a 12 in. by 12 in. timber, the load being carried on the other two widths during this change.

Three-inch plank and wedges were then used to take the load on the 12 in. by 12 in. blocking, just inserted, and the next pile of 3 in. by 12 in. plank was replaced by the heavier blocking. This method was followed under bridge shoes and stringer bearings until a course of 12 in. by 12 in. blocks extended the full length of the pier or abutment. When the bridge was raised to within 18 in. of its final position, four piles of 3 in. by 12 in. plank, four feet in length, laid at right angles to the axis of the bridge, were used under each shoe, with a like arrangement under the stringer bearing. This was to permit of the easy installation under the end of each span of four 18-in. I-beams running the entire length of the pier, or 25 ft. These beams were inserted to replace one pile of blocking at a time, and after all were in place, they were securely tied together by batten plates. The I-beam grillage on top of the blocking was provided to carry the dead and live load of the structure while replacing the wooden blocking with the permanent concrete extension to the height of the pier.

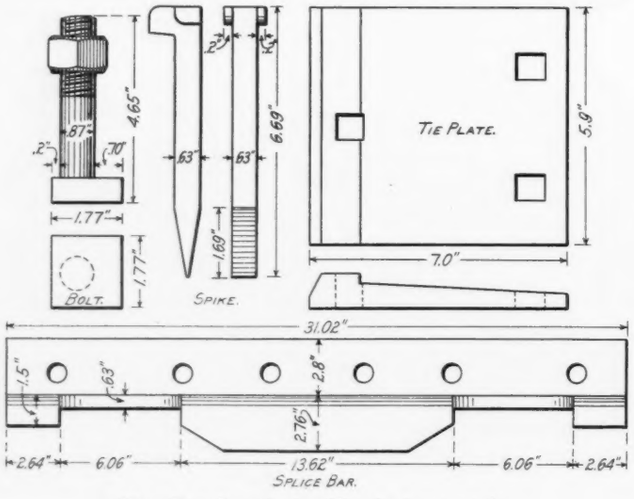
By sawing the 3 in. by 12 in. ties at right angles to the

12 in. by 12 in. blocking, it was possible to remove all of the 12 in. by 12 in. blocks from under the I-beams immediately below the shoes, the space being bridged by the beams. A block of concrete four feet in length, extending the full width of the pier, was poured with the top flush with the top of the beams. This arrangement was carried out on one pair of shoes on the piers at a time, and likewise for each shoe on the abutments until the trusses were carried on permanent bearings. The wooden blocking under the ends of the beams and between these concrete blocks were then removed. The stringer load was supported by the beam grillage reinforced with one 12 in. by 12 in. post under the end of each stringer. Round rods were inserted in the concrete blocks under the shoes and projected on each end to act as dowels. The piers were thus extended to the new height and are finished with the concrete-encased I-beam grillage for the bridge seat.

The raising operations were carried on in daylight alone, at such intervals as scheduled train service permitted, and consumed 13 days' time. The work was done by the railroad company forces under the immediate supervision of E. W. Holmes, master carpenter. It is worthy of note that not a single one of the numerous passenger trains passing over this structure was detained, and that the longest detention to a freight train, after it had arrived at the bridge, was five minutes. The structure was taken up true to line, except at the north abutment where a lateral movement of two inches occurred, which was corrected easily by the use of jacks. There was no longitudinal movement in any of the trusses.

RUSSIAN STANDARDS OF TRACK CONSTRUCTION

The Russian government has placed several orders for rails aggregating over 300,000 tons with the steel mills of this country. It has also ordered large quantities of tie plates, bolts, joints and spikes for use with these rails. All of these materials have been made in accordance with the standard designs of the Russian Government Railways and although similar in many respects to our standards they vary therefrom in numerous important details. Because of the special details

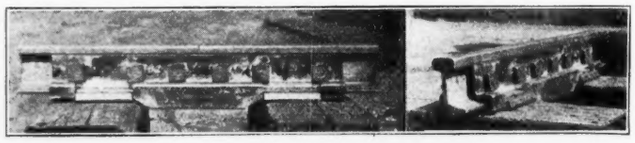


The Details of the Track Accessories

introduced their manufacture has introduced a number of complicated problems in the mills.

The rails are of two sections weighing 74.75 and 68.98 lb., respectively. Except where noted otherwise, the dimensions given below are for the heavier section of rail and for the corresponding track fastenings. The rails are of the T-section as opposed to the bull head section used on some European railroads. They are being rolled in 42-ft. lengths. The heavier section is 12.8 cm. (5.04 in.) high with a base 11 cm. (4.33 in.) wide. The head is 6 cm. (2.36 in.) wide with vertical sides and a depth of 3.7 cm. (1.45 in.). The top surface is curved to a radius of 30 cm. (11.8 in.) and the lower side is inclined on a slope of 1:3. The web is of a uniform thickness of 1.2 cm. (0.47 in.) and is 6.8 cm. (2.68 in.) high. The upper surface of the base is broken on two slopes of 1:3 and 1:7⅔, respectively. Each end of the rail is drilled with three bolt holes, these holes in the rail being elongated rather than in the angle bar, as is the practice in this country. The diameters are 2.5 cm. (0.97 in.) and 3.3 cm. (1.30 in.), respectively.

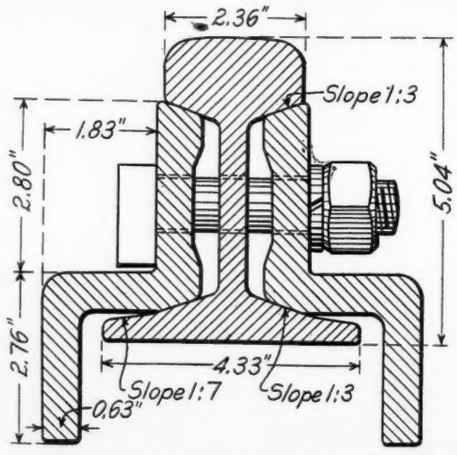
As shown in the accompanying drawing, the joint corresponding with this rail section is 78.8 cm. (31.02 in.) long.



The Joint Assembled

It is rolled with a depending flange extending 7.0 cm. (2.76 in.) below the base of rail, which flange is cut away near the ends to fit over the ties. The joint is designed as a suspended joint with each bar weighing 34.18 lb. The base of this joint bears on the base of the rail only on the 1:3 slope, the remainder of the depending flange extending above and around the outer edge of the base of the rail without being in contact with it.

The tie plate is 150 cm. (5.9 in.) wide by 178 cm. (7.0 in.) long and is punched for two spikes on the inner and one spike on the outer or shoulder sides. The upper surface of the plate is inclined on a slope of 1:20 while the bottom is without ribs or corrugations. The plate is approximately ½-in. thick at the inner line of the base of rail.



Section of the Angle Bar and Rail

The bolt used is 2.2 cm. (0.87 in.) in diameter and 11.8 cm. (4.65 in.) long. It is provided with a square head 4.5 cm. (1.77 in.) wide. The bolt is set 1.3 cm. (0.51 in.) to one side of the center of the head to lock it into position in the joint. It is provided with a hexagonal nut and a spring washer 0.5 cm. (0.20 in.) thick.

The spike is 17 cm. (6.69 in.) long with a chisel point 4.3 cm. (1.69 in.) in length. The body of the spike is 1.6 cm. (0.63 in.) square. Instead of the flattened head used in this country, the head of this spike is provided with two wings 0.5 cm. (0.20 in.) wide.

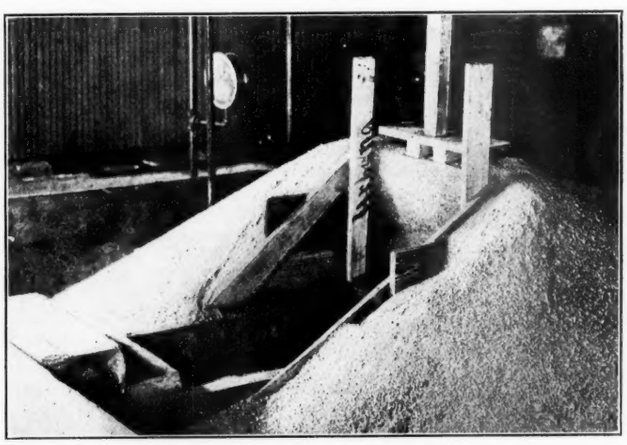
AMERICANS GIVE HOSPITAL TRAIN.—A volunteer hospital train of thirteen cars, the gift of two wealthy Americans, was presented to the French Government this week. The cars will be stationed at Chappelle, near Paris.

The Distribution of Vertical Pressure Through Sand

A Description of a Number of Experiments Made at the University of Illinois and of the Results Secured

By Melvin L. Enger
Assistant Professor of Mechanics and Hydraulics,
University of Illinois, Urbana, Ill.

Experiments on the distribution of vertical pressure through sand have been in progress for a number of years at the University of Illinois, and not only are the results obtained of interest but the experience gained has been helpful in planning the more elaborate experiments now being carried on to determine the stresses existing in railroad tracks.



Arrangement for Making Sand-Movement Photographs

The experiments comprise three separate and distinct divisions. The first division concerns the determination of the variation in pressure with the variation in the depth of the sand and the size of the loaded area, the second concerns the determination of the influence of variations in the horizontal distances to the axis of the vertically applied load, and the third concerns the determination of the movement of sand under a condition of vertical loading by means of photography. The first two divisions of the experiment were performed on a layer of sand varying from 6 to 18 in. in thickness and supported on a concrete slab 9 ft. by 8½ ft. by 16 in. The loading device for applying the pressures to the sand consisted of a hydraulic jack which reacted against a 20-in. I-beam connected with the slab by means of four 1-in. steel rods. The load was weighed with a calibrated steel spring whose deflection was indicated on an Ames dial gage. This device was made movable so that the load could be applied at various points on the top surface of the sand.

For the first portion of the experiment the intensity of the pressure was obtained by means of a section of 6-in. pipe cast in the slab, closed on the lower end by a blind flange, and with a beveled edge flange screwed to the top, flush with the concrete surface. A diaphragm of rubber packing was clamped over the beveled edge by means of a beveled collar, and the intensity of the vertical pressure upon this diaphragm was measured by means of water pressure transmitted to a pressure gage through a ¾-in. pipe line. The pressures were applied directly over the diaphragm with plates 9 in., 13½ in. and 21 in. in diameter. The 21-in. plate carried loads up to 18,000 lb., the 13½-in. plate up to 9,000 lb., and the 9-in. plate up to 2,500 lb. The sand was thoroughly compacted before taking the reading. For example, when experiments were being made with a depth of sand of 12 in., the plate was started on a layer of sand about 15 in. deep and forced down to the 12-in. depth. The load was then released and applied several times. The readings were taken of the applied load and the load transmitted

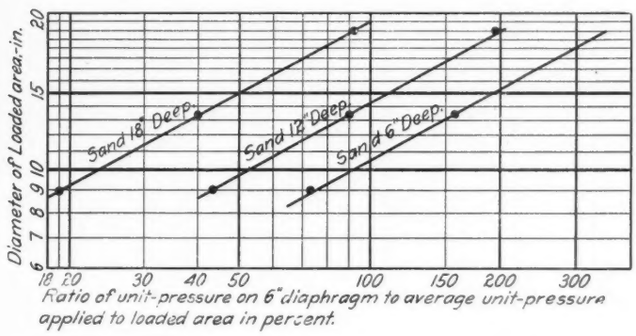
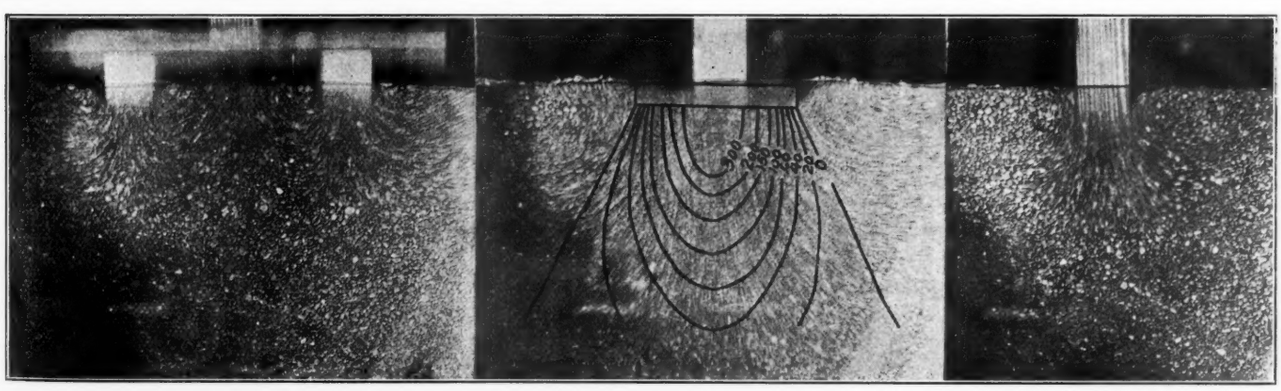


Diagram Showing Effect of Variation in the Diameter of the Loading Plate.



Direction and Extent of Pressures in Sand Under Load as Obtained by Time Exposures of the Moving Particles

to the diaphragm. In a similar manner, readings were taken for depths of 6 and 18 in.

In an accompanying diagram the average values of the ratio of the unit-pressure on the 6-in. diaphragm to the average unit-pressure applied to the loaded area are plotted as ordinates and the diameters of the loaded area as abscissas, using logarithmic scales. It will be seen that parallel straight lines pass through the points which are plotted for each given depth of sand. From the slope of the lines it is found that the proportion of the applied aver-

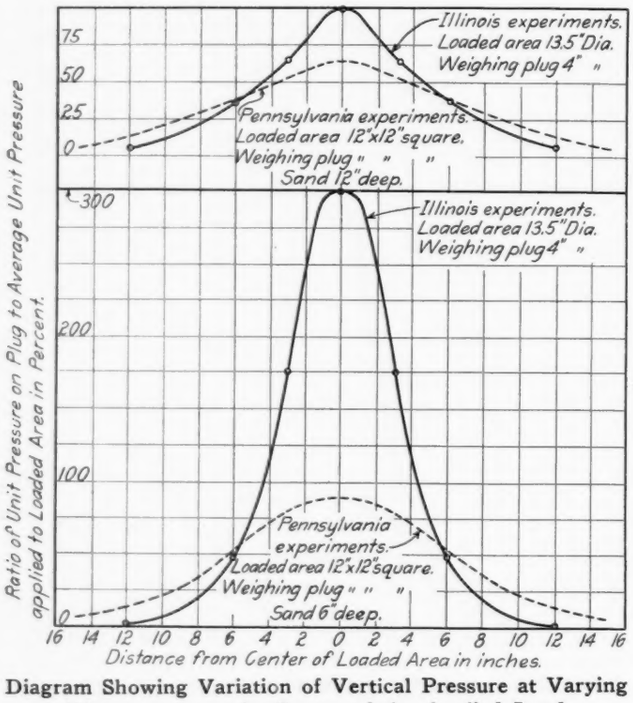


Diagram Showing Variation of Vertical Pressure at Varying Distances from the Center of the Applied Load

age unit load which is transmitted through sand of a given depth to a diaphragm directly below varies as the 1.86 power of the diameter of the loaded area. It follows, for example, that if a load is applied to a plate 9 in. in diameter such that the intensity of pressure on a small area at a certain distance directly below the center of the plate is 10 lb. per sq. in., then if the same total load is applied to a plate 21 in. in diameter the intensity of pressure on the same small area would be 8.9 lb. per sq. in. That is, by increasing the area carrying the load 5.44 times, the intensity of the pressure in the sand directly below the plate at a given depth has been decreased but little, a conclusion very different from the usual assumptions.

In the second section of the experiment the pressures were taken on a 4-in. wooden plug or plunger fitting loosely in a hole in the top of the slab 4⅛ in. in diameter with the top of the plug flush with the upper surface of the slab. The hole containing the plug communicated with a horizontal hole 6 in. square extending into the slab from the side a distance of 3 ft. 8 in. Into this hole a 3-in. I-beam was inserted upon which the plug rested by means of a knife edge. The I-beam acted as a lever transmitting the load to a platform scale set to one side of the slab. These experiments were made with the same depth as with the preceding one and with a plate under the jack 13½ in. thick. Readings were taken on the plug with the jack located centrally over the plug and also at horizontal distances of 3, 6, 12 and 18 in. away from the plug. According to these experiments the ratio which the intensity of pressure directly below the center of the loaded area bears to the applied average unit load varies inversely as the 1.95 power of the depth of the sand above the plug. Assuming that this relation holds for other diameters of loaded area and combining this result with the effect of the variation in diameter previously described, the following equation was found:

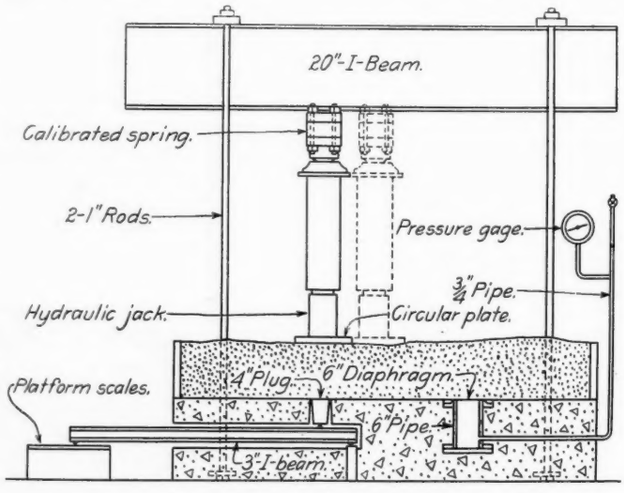
$$p = 91\frac{d^{1.86}}{h^{1.95}}$$

in which "p" is the ratio, expresed as per cent, which the intensity of the transmitted pressure at a point "h" inches directly below the center of the loaded area bears to the average applied unit load, and "d" is the diameter of the plate in inches. The equation represents roughly the results of the experiments, but it is not probable that it has general application.

In the experimental work the diaphragm has been found to be a less satisfactory method for measuring the transmitted pressures than the method of weighing the load on the plug. The reason is that the diaphragm becomes distorted when load is applied, the center being depressed and the outside portion raised by the water pressure, and the distortion increases with a repetition of the load.

For off-center loadings the depression occurs in the part of the diaphragm nearest to the center line of the applied load, while the part farthest away is forced up. So much trouble was experienced with the bursting of the diaphragm that it could not be used for off-center loads on thin layers of sand.

In another diagram have been plotted curves showing the intensity of the transmitted pressure at different distances from the center line of the applied load in terms of the applied average unit load, as determined by experiments in which the transmitted pressure was measured by the 4-in. plug, one being for a depth of sand of 6 in., the other for 12 in. The curves are of interest in showing the lateral distribution of pressure over a horizontal plane at a given depth. Dotted lines giving the results of experiments made at Pennsylvania State College are also plotted in the two figures. In the Pennsylvania experiments the load was applied to an area 12 in. by 12 in., and the pressure was measured on a plug of the same size. The measured pressure was



Arrangement of Apparatus

therefore the average over a relatively large portion of the base. The Illinois and Pennsylvania experiments have one inconsistency in common; the sum of the upward pressures under a 6-in. layer of sand exceeds the sum of the applied load and the weight of the sand. The reason, in the case of the Illinois experiments, is that center loadings were taken first, leaving a pillar of compacted sand above the plug which carried more than average pressures to the plug for the off-center loadings which followed. For depths

greater than 6 in. the effect of the compacting was not as great. It is probable therefore that the readings at 3 in. and 6 in. away from the center are too high for the 6-in. depth of sand.

For the third section of the experiment—to show the direction of the movement of the sand under the action of a load, the arrangement shown on one of the accompanying photographs was used. Sand was piled against a sheet of plate glass and a camera was placed on a block about three feet from the glass. Time exposures of from 60 to 90 sec. duration were then taken while the blocks were forced slowly and uniformly into the sand. As the sand moved, elongated images of the grains were formed on the photographic plate. The lines formed in this manner therefore show the direction of the movement of the sand for various conditions of loading.

In one of these, results of the other experiments are plotted to show lines of equal vertical pressure in the sand below the plate. The line of zero vertical pressure has been drawn downward on a one to two slope, and an inspection of the experimental results indicate that the vertical pressure outside of this line must be very small. It will be noticed that the region below the center of the load is one of high pressure, a fact of importance which seems generally to have been overlooked. The diagram is instructive in showing the manner of the distribution of the vertical pressure at different depths and different distances from the axis of the load. It is seen that the pressure on any horizontal plane is far from uniform.

Other pictures are suggestive in showing the manner in which the pressure in the ballast under a railroad tie is affected by the loading and spacing of the adjacent ties which restrain the horizontal movement of the ballast. It is evident also that the pressure in the ballast will not approach uniformity until a considerable depth is attained. The tests and the photographs suggest that the transmission and distribution of pressure downward through earth and ballast is different from assumptions which is frequently made.

This work was carried on as thesis work by five students of the University from the classes of 1910, 1911, 1912 and 1913.

YARD MAINTENANCE

By Charles L. Van Auken

Yard maintenance differs materially from section maintenance in many features. The yard foreman must bear in mind that yard tracks do not need to be maintained in as good condition as main line tracks. While the tracks must be kept absolutely safe, the foreman should take into account the low speeds used; it is not economical to keep a track safe for traffic at 50 miles per hour if 15 miles per hour is the highest speed allowed. Yard tracks should be laid out on tangent if at all possible, particularly because the maintenance is likely to be slighted for long periods. Curves increase the cost of maintenance and also the likelihood of derailments.

The following discussion indicates in a general way, the order of the work on a section during the four seasons. It is advisable in yard work as in section work to start renewals in the spring soon after the frost goes out. When the weather is mild, it is profitable to relay rail in the winter and thus decrease the spring and summer work.

In planning to overhaul a yard, a foreman is sometimes ordered to start at one side and raise each track out of face in turn. This is not the best practice because a foreman will usually be unable to get over the entire yard and raise and make renewals on some tracks while others are in greater need of repairs. A foreman should be allowed to exercise his discretion and work on the worst tracks first; after this is done he should start at one side of the yard and raise the remaining tracks out of face as far as time allows.

The principal work in spring is to keep switches free from water and ice so that switching will not be delayed. Constant attention to drainage is necessary. Wherever possible, open ditches should be dug to drain the water away from snow holes around switches and frogs. These ditches, if deep, should be covered with boards, car doors or other lumber which is handy, so that they will not be a source of danger to switchmen and others, and also to keep them free from rubbish. Where there is no outlet for ditches, the snow holes should be bailed out every night, and the ice should be thrown over the bank or scattered back of the frog. On inside tracks it is often necessary to load the ice into any empty cars which happen to be handy.

Every large yard should have a drainage system, with a manhole at each switch. The catch basins should be inspected and cleaned out often in the spring so that they will not freeze or become clogged. A plentiful supply of salt should be kept on hand to scatter around switches and frogs, when necessary, to melt the ice off the ties.

The departure of frost from the ground is likely to develop uneven track, causing switches to bind, and resulting in rail breakages. Such places may require additional temporary shimming. Where wet spots develop, the holes should also be shimmed up if possible until the ballast dries out.

Where there is no support for the ties in mud holes or at churning joints, the old mud should be shoveled out at least to the bottom of the ties and replaced by cinders for use in raising the track. Dry gravel can be used if cinders are not available.

The curves in yard tracks and the leads in ladder tracks are likely to cause trouble at this time of the year. The ties will be slippery from water or ice and the gage will tend to widen. The ties, when wet, are softer and therefore offer less lateral resistance to the spikes.

After the frost is out, the yard and ladder tracks should be cleaned thoroughly. Surface ditches should be filled in at this time. Dirt, ashes, cinders and all accumulations from cars should be loaded onto flat cars and unloaded along the main line to strengthen embankments or fill holes in the right of way. In doing this cleaning, the tops of all ties should be exposed to facilitate drying.

It is also important to gather up all the scrap which has accumulated during the winter and to pile it at convenient points for loading into cars. Track scrap consisting of spikes, bolts and nut locks as well as car scrap of all kinds, should be picked up and carried to the scrap bin.

Spikes and bolts which have loosened during the winter should be tightened and another inspection given to the entire yard, special attention being given to low places in ladder tracks. Shims may now be removed and the track should be raised on good ballast.

Tie Renewals

Where yard tracks are to be surfaced, tie renewals should be made when these tracks are raised, as renewals may be made much more easily and cheaply at that time. On storage tracks ties are sometimes allowed to remain until almost nothing is left of them. At such places the best method is to raise the track with jacks, knock the ties off with spike mauls, clean out and then place the new ties under the rails. After this the track may need some surfacing, but this method permits the foreman to accomplish much more and leaves better track than if he makes the renewals in the ordinary way.

For yard tracks the exact number of ties for a day's work should be distributed each morning and at night all the old ties be picked up and carried out to avoid danger to trainmen. If the number of ties to be renewed per rail length is large renewals in yard tracks can best be made by taking the

track out of service. The spikes can then be pulled from the few sound ties and the track jacked up with the unsound ties hanging. These can be knocked off easily and pulled out of the way. The beds are then dug down and the new ties placed. The new ties are dug in low enough so that the rails, when dropped, again rest on the old ties, the original surface thus being maintained. The new ties are then nipped up, spiked and tamped.

When it is inexpedient to block a track, the old method of digging in one or two ties at a time is used; or a few spikes may be pulled on adjoining ties, the track sprung up, the old ties pulled out, the beds dug down and the new ties placed, thus requiring little side digging. Renewals should be made on a running track first. Then permission should be obtained to make the running track a storage track for the time being and to use an adjacent yard track as the running track. Thus, by using storage tracks in rotation for run-around tracks, all renewals may be made on an open track under traffic.

Ladder tracks can seldom be abandoned. The old method of digging out and putting in one or two ties at a time may be the best one to use, especially if the ladder is in constant use. Another way is to dig out the full set of switch ties after having distributed the new set ready to be placed in the track. On ladder tracks subjected to heavy traffic, switch ties should be renewed in sets and not singly. The ballast should be stripped to the bottom of the ties and six inches beyond the ends and the spikes ahead of the switch point and back of the frog should be raised so that the rails may be jacked up without lifting the track ties off their beds. The spikes may then be pulled on three or four ties, the track jacked up, the old ties pulled out, the new ties put in, the jacks dropped, and the track spiked safe for traffic, or the new ties may be pulled in between the old ones and spiked before the old ones are withdrawn. This method makes it possible to utilize a period of only three or four minutes between switching movements.

The surfacing of ladder tracks should have the preference during periods of slack business. More can be accomplished with less delay while the inside tracks can be raised when business is heavier. Yard tracks may be surfaced according to the same program used in renewing ties—surfacing the running track first, then using the running track for a storage track and one of the yard tracks for a running track. If it is possible to have a track abandoned it is advisable to make tie renewals at the same time the surfacing is done, as this decreases the cost of the work considerably.

Where the rail in a track is to be relayed, tie renewals should be left until the time of relaying. This will prevent respiking new ties. If renewals must be made before relaying, the new ties should be tamped up to the rail but just as few of them should be spiked as are absolutely required to hold the track to gage; the remaining ties to be left unspiked until the new rail is laid. This not only saves the ties but decreases labor.

A foreman should run over his yard in the fall and pick up any particularly bad spots which have developed since the summer work to decrease shimming and broken rails in winter. Yards should be cleaned up before the first snow, particular attention being paid to ladder tracks and leads. Accumulations of dirt, cinders and other rubbish, if left until the winter time, will make it difficult to keep the tracks in shape for use. Old ties and rubbish should be burned or otherwise disposed of. Rails, switch points, frogs and car scrap of every kind should be loaded at this time.

Frogs, switches and guard rails should be inspected and renewals made where necessary. Little of this work should be left for the winter, as renewals are not only more difficult to make then, but there is seldom time to devote to them without neglecting the more important work of keeping the tracks clear of snow and ice. Before the ground freezes, snow holes should be dug under switch rails, frogs, old type guard rails, mechanical interlocking cranks, compensators, etc.

A foreman should check up his equipment and see that he has plenty of sharp picks and bars, salt, rattan brooms, snow boxes, hydro-carbon and other materials which winter work is likely to require. These tools and supplies should be ordered early enough so that they will arrive before the first snow storm. The men should also go over the yard and ladder tracks looking for loose bolts, driving down high spikes and regaging the track wherever necessary.

Even in a large yard a foreman should know and keep in mind the exact location of every switch without having to refer to a diagram. Then when a snow storm requires the hiring of extra men, the foreman can assign them to definite locations before they leave the tool house, sending out a gang of green men with one of the old section hands, and telling him the switches he is to keep clear. By assigning the men in this way the work will be started without delay. The foreman should then patrol the yard constantly and rearrange the force as conditions demand.

Switches should be cleaned out half a rail length ahead of the switch points and about the same distance behind the frogs so that any snow which is dragged along by trains will be dropped before it gets to the switch. When the snow gets too high between yard tracks a snow train is usually called out, although ballast spreaders have been used for this purpose to some extent. In passenger terminal yards where space for piling snow is limited, it will probably be necessary to put on a snow train when a snow storm starts, but in freight yards the train can usually be dispensed with until after the storm is over. In coach yards there is little space between the tracks and usually that is occupied by walks which must be kept clear, while in the freight yard there is little occasion for walking between tracks during the storm.

PENNSYLVANIA RAILROAD DOCKS AT CANTON WHARVES, BALTIMORE, MD.

Work has been started on the construction of a new reinforced concrete coal pier for the Pennsylvania Railroad at Canton Wharves, Baltimore, which will provide facilities for loading 20,000 tons of coal daily into vessels. This dock is 66 ft. wide and 942 ft. long, and consists of a reinforced concrete deck supported on concrete longitudinal and transverse beams carried on creosoted timber piles. To enable the dock to be operated during cold weather, a thawing house with a capacity of 30 cars will be provided in which coal frozen in the cars will be thawed out by steam. Storage bins will be constructed at the end of the pier to hold coal of different grades for local harbor trade, coal being transferred from the bins to these boats by a small traveler. A storage yard with a capacity of 1,000 cars is also being provided.

In operation the cars will be pushed from the yard on to a "kick-back," from which they will descend by gravity to the dumper, where the coal will be unloaded into a hopper. Small four-ton cars will be operated by means of an endless cable from a point under this hopper up an incline and out on to a trestle along the center of the pier, along both sides of which traveling unloaders will be provided, which can be moved to any desired location. The small cars will be dumped automatically into hoppers constructed on these unloaders, and the coal will then be elevated by a conveyer to telescopic chutes lowered into the holds or bunkers of the vessels.

This pier has been designed for the Pennsylvania by the Cleveland Dock Engineering Company, Cleveland. The contract for the dredging has been awarded to the Maryland Dredging & Contracting Company, Baltimore, while the pier will be built by the Arthur McMullen Company, New York; and the machinery will be furnished by the Mead-Morrison Manufacturing Company, Chicago.

General News Department

A fire of unknown origin caused damage to the extent of about $1,000 in the Union station at Indianapolis, Ind., on February 2.

Track watchmen on the Middle division of the Pennsylvania Railroad have been notified that henceforth they will have two days off duty each month, with pay.

In the United States District Court at Baltimore, Md., February 1, the Baltimore & Ohio was fined $700 for violation of the law in keeping trainmen on duty more than 16 hours.

The Wabash, effective on February 15, increased the pay all over the system of its station and yard clerks, who have been in the service of the company over one year, by amounts ranging from $2.50 to $10 a month. The advance affected about 800 men, and will amount to about $47,000 yearly.

The Senate on Wednesday passed the Newlands resolution providing for a joint congressional committee to make a general investigation of railroad and transportation business, including an amendment, offered by Senator Borah, extending the scope of the inquiry to include specifically the question of government ownership.

The Southern Pacific has announced that at the end of the fiscal year it will award a watch fob, with a gold charm, to each of the six men on each division and in each general shop who rank highest in the number of points scored for safety suggestions. The points will be computed from the number of suggestions offered, and according to the character and the importance of each suggestion.

Enginemen on the Chicago & Eastern Illinois have asked for an increase in wages based on the award of the board of arbitration for the western roads, which was made last year. The Chicago & Eastern Illinois was not included in the arbitration because it had been considered as an eastern road. The enginemen now ask that it be included in the western district. Part of the line lies in the eastern territory and part in the west.

The Merchants' Association of New York City which, in its campaign to support the railroads in their demand for fair treatment in the matter of mail pay, has asked the co-operation of commercial bodies in other cities, publishes resolutions, adopted in response to the New York appeal, which have been received from chambers of commerce and similar bodies in Boston, Baltimore, Seattle, Pittsburgh, Cleveland, Buffalo, Jackson, Mich., Washington, Pa., Erie, Pa., Stockton, Cal., and Berkeley, Cal.

Conductors on the Atlantic Coast Line are objecting to the presence of train auditors on their trains, and it is claimed that over 99 per cent of the conductors on the system have voted to sustain a committee in making "demands" of the company; but this percentage applies to the whole of the force, both passenger and freight. On Tuesday of this week it was said that the grievance of the conductors was so serious that a request would be made on the United States Board of Mediation and Conciliation to consider the matter.

The Baltimore & Ohio's Safety First campaign during the past year has produced gratifying results. Employees have held 204 safety committee meetings, and have made 17,066 recommendations in the interest of safety; and 16,411, or 96 per cent, of these were disposed of. To the general use of goggles by mechanics, the company's physician attributes a prevention of fifteen injuries to employees' eyes on one division. There has been a decrease in the number of accidents, though the force was augmented to handle increased business, and inexperienced men were taken into the service.

The Erie Railroad has begun suit in court at Paterson, N. J., to recover $13,000 from the owner of an automobile which was struck by one of the company's trains on a crossing at Lodi, N. J., about a year ago. It appears that the company paid damages amounting to the sum named on account of the personal injuries caused by the collision of the train and the automobile, and now sues the owner of the automobile, charging negligence. Dr. A. F. Alexander was married in New York on December 10, 1914. After the ceremony two clergymen and their wives, guests, started back to Paterson in Dr. Alexander's automobile, driven by his chauffeur, Joseph Kane. Near Lodi the automobile was wrecked, and Mr. Merriam was killed and the others injured; and the railroad settled damage actions later. The chauffeur's action for $20,000 is pending. Dr. Alexander is now dead and the Erie sues his widow for the $13,000 it has paid out, charging the chauffeur with carelessness.

Exhibits at the June Mechanical Conventions

A meeting of the exhibit committee of the Railway Supply Manufacturers' Association will be held today at Room 3136, Oliver building, Pittsburgh, Pa., at which time it is expected to allot about 70,000 sq. ft. of exhibit space at Atlantic City for the June conventions. This is practically the full amount of space occupied last year. At about this time in 1914, when the exhibits occupied over 80,000 sq. ft., applications had been received for only about 17,000 or 18,000 sq. ft. Approximately 180 applications have been received by the committee, over 18 per cent of which are from concerns that did not exhibit last year. Those intending to exhibit this year who have not yet made application for space should do so at once, as the available space is rapidly being taken and is not expected to meet the demand. All applications should be addressed to the association at its headquarters, 3136 Oliver building, Pittsburgh, Pa.

Strike on the Alaskan Government Railways

A strike has been called by the laborers working on the Alaskan government railways, and work is now at a standstill. The grading for the first 35 miles of the line from Anchorage was completed early in November, but a small force has been employed in constructing bridges and laying track. Following the cessation of active work for the winter a large number of idle men have collected at Anchorage. According to newspaper reports a recent meeting was held at Anchorage at which a labor union was organized with an enrolled membership of 600. This union immediately called out on strike those men still employed, demanding an increase in the wages of common laborers to 50 cents an hour. The minimum provided in the wage scale paid by the government was 35 cents an hour, and the men in the track laying gangs received 37½ cents an hour. As the appropriation under which this work is being carried on is practically exhausted, no attempt will be made to resume work until the President has signed the urgent deficiency bill carrying an appropriation of $2,000,000 for this project.

W. C. Edes, chairman of the Alaskan Engineering Commission, advises the *Railway Age Gazette* that "Commissioner Mears had a small number of men working on track laying and bridge building at Eagle River bridge, about 20 miles from Anchorage, who demanded higher wages. Their request was not granted, and the work trains were brought back to the terminal at Anchorage. The report that several hundred men were at work is erroneous."

The Mail Pay Question Before Congress

Ralph Peters, chairman of the railroads' committee on railway mail pay, has replied in vigorous language to the charge made by Chairman Moon, of the House Postoffice committee, that the railways maintained a lobby against the legislation, providing for payment for mail transportation by space instead of by weight, proposed by the Post Office Department. He says:

"We absolutely deny Chairman Moon's accusations. We have no lobby. But we are making a plea to the country in a fight for our very existence against the mistaken ideas of certain men

in Congress, who feel that they have the right to do what they please with the property of others, regardless of what the consequences may be. . . . The purpose of the Moon bill is to enable the Post Office Department to carry on a commercial transportation business under the guise of parcel post. This will deplete the freight revenues of the railroads, burden their passenger trains with heavy freight, and will give them less for carrying the traffic than the Interstate Commerce Commission allows them for similar service on freight trains. The railroads are facing unfair competition and confiscation, and are united in protest against it. We have argued and pleaded with the House committee against such injustice, but in vain. The railroads are owned by people who are entitled to as much consideration as any class of citizens. There is no reason why their property should be taken from them under the mistaken idea of benefiting some other class. As we could obtain justice no other way, we have appealed to the people as a whole.

"Why is the Post Office Department not willing that this question should be referred to the Interstate Commerce Commission, which now regulates the rates allowed the railroads for all other forms of traffic? We proposed this solution of the question to the House committee, but it was rejected, together with all other suggestions that we made. . . . As American citizens, and on behalf of those who have invested their savings in the railroad properties, we appeal to the people for fair play, and we deny that such an appeal is lobbying."

Mr. Peters has issued an appeal to voters asking:

"Why haven't the railroads a right to speak in their own behalf? Why must they keep silence while they are accused of misrepresentation, greed, extortion and even of 'looting the postal revenues'? Why are the citizens whose savings have built the railroads to be denied the freedom of speech and the press?

"Here is what the railroads have done: They have issued a number of pamphlets giving their views, with the full supporting facts, concerning the railway mail pay question. They have distributed these pamphlets as openly and publicly as possible, plainly labeled as to their source; have sent them to members of congress, to every daily newspaper, to the members of the Interstate Commerce Commission and of all State Railroad Commissions, to the President and members of the cabinet and to many other persons in public or semi-public life. Was this lobbying? . . . The railroads' campaign has been carried on in the light of day. What justice is there in calling it a bad name?"

Cement Show

The cement show held this week at the Coliseum and First Regiment Armory in Chicago opened February 12 with the best exhibition yet held. One feature of the exhibit is that all of the manufacturers have united in giving educational exhibits showing the various uses of concrete. At the American Concrete Institute meeting in the Auditorium, which will last from Monday to Friday, there will be papers, discussions and committee reports on all phases of concrete construction work.

Safety—Courtesy—Service

This is the heading of a "human document" in the shape of a large placard, addressed to all employees, which recently has been issued by Chas. A. Wickersham, general manager of the Atlanta & West Point and the Western of Alabama, on the subject of giving information concerning blockades. He says:

Any blockade to passenger traffic by floods, washouts, or accidents is always a source of keen interest to the public, and especially to passengers and to those about to engage in a journey, or who as friends have come to meet a train or to speed a parting guest; but, as a general rule, their natural curiosity is balked, if not actually offended, by the reticence of employees, who customarily give but meagre replies to inquiries. This reticence is due, of course, to a very natural, and in the main proper, spirit of reserve; . . . an unwillingness to appear loquacious in the face of an emergency.

It is our earnest desire to not only keep step with progress, but to lead the way in matters looking towards the promotion of closer common interests with our patrons and the public, and in line therewith this notice is issued to impress you anew with the fact that it is our policy to regard the public as a partner in our good or bad fortunes; and not only are we willing, but indeed do earnestly desire that you recognize the interest and moral right of the public, as a member of the family, to be as fully informed as possible concerning any occurrence of this sort.

In future, upon the occasion of any of these blockades, the superintendent will inform the agents and conductors as to just what has happened, and this information should be promptly disseminated to the waiting public at stations and to the passengers on trains. In the case of a woman with small children and a lot of miscellaneous hand baggage it is quite conceivable that if informed by the agent, before boarding a train, that there would probably be a delay passing a blockade, or that it might be necessary to get off and walk around the obstruction, she might prefer to postpone her trip until a later time. Even if this should mean the loss of a few fares occasionally, we should view that result with the greatest cheerfulness, in the knowledge that discomfort or inconvenience to our good friends and patrons may have been averted, to the advancement of friendly feeling in the hearts of the people.

Statement of Brotherhoods on Wage Demands

The Brotherhood of Locomotive Engineers, the Brotherhood of Locomotive Firemen and Enginemen, the Order of Railway Conductors and the Brotherhood of Railroad Trainmen on February 10 issued a statement regarding the proposals now being voted on by the membership of the brotherhoods for an eight-hour basic day and time and one-half for overtime in train and engine service. The statement is apparently in reply to those issued by the railroads. Some extracts from the statement are as follows:

"All of the leading industries and trades, railroads excepted, have recognized the economic justice of the eight-hour day. We believe it can be adopted with no greater inconvenience by the railroads than accompanied its introduction in other employments.

"The eight-hour day movement is based wholly upon the justice of a work day of reasonable hours. If men are worked out in a few years under present service conditions, as the railroads in effect declare, the demand to extend their wage earning years is fully justified.

"Overtime in road service is due almost wholly to the practice of railroads overloading trains so that they cannot make their mileage within their time limits. The railroads are doing this for profit; they do not deny it, and if they propose to demand extra service at the sacrifice of the health and future earning ability of the men they should pay extra for it. The payment of overtime applies with particular force to yards where the companies can regulate their work so that no overtime need be made. If they exact extra service, it is to their own interest and the men have a perfect right to demand time and one-half for that service.

"The railroads contend that the men are not sincere in their demand for the shorter work day; they declare they want a wage increase rather than a time decrease, and refer to a small number of the men who prefer the extra jobs to prove it. If the companies desire to test the sincerity of the men, let them prove their belief in what they say and establish the eight-hour day so that the men do not have to make a minute of overtime.

"The statement has been made that the payment of overtime is an incentive to delay work during the regular working time. It does not apply to railroad service. Both the employers and the men know that if delays are made without reason, the men are called to account for it; if at fault they are disciplined, and the companies have it within their power to determine whether or not delays are unnecessary.

"That there is not so much justification for the contention of the railroads that the eight-hour day is impossible is proved by the fact that at the present time there are seven roads in the Southeastern, and one in the Western territory, that pay overtime on an 11 miles per hour basis. Six roads in the Southeastern, and two in the Western territory, pay overtime on a 12 miles per hour basis. Eight in the Southeastern, and

five in the Western territory, pay overtime on a 12½ miles per hour basis. There is only one road in the United States of which we have knowledge that works more than the 10-hour work day, namely, the Monongahela.

"The question has been raised, 'Whether there should be a national regulation of wages on the railroads, to be administered by a special board?' This is a question that at this time should not enter into a discussion of the main proposition. It contemplates, however, so great a departure from the present methods of fixing wages that certain inquiries as to its effect are pertinent. The most important are these: Does the proposition by implication mean that wages so fixed would have to be accepted by the employees without question? Is it the idea that wages and conditions once decided by a board of the character suggested would mean that the employees would have to accept them and remain in service? If neither of the suggestions applies to the proposition, and railroad employees are to be left perfectly free to accept or reject wages and conditions fixed by such a board, and would not consent to work under them, it would leave the situation exactly as it is. There does not appear much to be gained by the creation of such a board unless involuntary servitude is expected to be a part of its application. Understanding the question as it has in this way been answered, the railroad organizations are opposed to it.

"The question has been asked: 'Whether the railroads in responding to the present demand of the four brotherhoods should reduce the wages of other classes?' Certainly not. The effect of wage increases to the four brotherhoods in the past has been to encourage increase in wages to all other employees, whether or not they were organized.

"Another question has been asked: 'Whether they should reduce interest and dividend payments?' So far as railway employees are concerned, that is a matter with which they have nothing to do.

"We are asked, 'Whether they, the railroads, should seek another increase in rates?' This is asked on the assumption that wages are to be increased. The men are not asking for more money. They are asking for a shorter work day. If the railways insist on a longer day, then it will mean increased pay. If the railways need revenues to meet their increased costs of operation, yes. There is no other business in the United States that is not at perfect liberty to adjust its revenues to meet its costs of operation. The fact that the railway companies must first secure authority from the Interstate Commerce Commission to raise rates places them in a different position entirely from the remainder of the business in the country. This, however, is not the fault of the employees, and it is wholly unfair to expect that approximately eight million railway employees, and their dependents, must sacrifice their interests to the general betterment and welfare of the remainder of the population.

"We are asked, 'Whether they, the railways, should refuse the present demand and risk a strike, should arbitration be refused by the employees?' This is a question that at this time is not a part of the discussion. Whether arbitration will even be suggested or whether it will be agreeable to either side is a subject that at this time cannot even be guessed.

"The position of the railroad organizations in regard to arbitration is about the same, and might be expressed in general terms as follows: They are not opposed to arbitration, neither are they pledged to accept it. They are practically pledged to peace but that does not mean peace at any price. The organizations do not desire to take issue with the public. They challenge even the inference that they have not always been fair to the public and they ask only from the public that which the public holds fast as its absolute right, namely, the liberty to make its own terms of service so far as it has the power. Now, to say what will be done, would be based wholly upon personal opinion and without organization authorization. It is true that in the past arbitrations the men were disappointed and to some extent lost faith in that method of adjustment of differences but there is neither warrant nor authority for saying that arbitration will or will not be accepted. Circumstances will determine the position of the men when the need arises and they will then decide what shall be done."

The statement is signed by W. S. Stone, grand chief engineer, B. of L. E.; W. S. Carter, president, B. of L. F. & E.; L. E. Sheppard, acting president, O. of R. C., and W. G. Lee, president, B. of R. T.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, date of next or regular meetings, and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Next convention March 21-23, 1916, Chicago.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except July and August, 220 W. 57th St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawlor Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, Hotel La Salle, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual meeting, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh, Pa.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month. Room 1856, Transportation Bldg., Chicago.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—C. W. Kelly, 349 People's Gas Bldg., Chicago. Next convention, March 21-23, 1916, Chicago.

NEW ENGLAND RAILROAD CLUB.—W. F. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meetings, 2d Tuesday in month, except June, July, August and September, Boston.

NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meeting, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. N. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria

RAILROAD CLUB OF KANSAS CITY.—Claude Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Saturday in month, Kansas City.

RAILROAD MEN'S IMPROVEMENT SOCIETY.—J. B. Curran, Erie R. R., 50 Church St., New York. Meetings, alternate Thursdays, October to May, Assembly Rooms of Merchants' Association, Woolworth Bldg., New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Monongahela House, Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Myers Bldg., Bethlehem, Pa. Midyear meeting, March 20, Chicago. Next annual convention, September, 1916, Grand Hotel, Mackinac Island, Mich.

RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

SALT LAKE TRANSPORTATION CLUB.—R. E. Rowland, David Keith Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. R. R., Atlanta, Ga. Next meeting, April, 1916.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Piedmont Hotel, Atlanta.

TOLEDO TRANSPORTATION CLUB.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEWARK.—Roy S. Bushy, Firemen's Bldg., Newark, N. J. Regular meetings, 1st Monday in month, except July and August, The Washington, 559 Broad St., Newark.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month, except June, July and August, Waldorf-Astoria Hotel, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Gen'l Agt., Erie R. R., 1924 Oliver Bldg., Pittsburgh, Pa. Meetings, bi-monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library Bldg., St. Louis, Mo. Annual meeting in November. Noonday meetings, October to May.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7122 Stewart Ave., Chicago. Next convention, June 21, 1916, Toronto, Ont.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, Superintendent's office, N. Y. C. R. R., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. R. R., East Buffalo, N. Y. Next meeting, September, 1916, Chicago.

UTAH SOCIETY OF ENGINEERS.—Frank W. Moore, 1111 Newhouse Bldg., Salt Lake City, Utah. Regular meetings, 3d Friday in month, except July and August, Salt Lake City.

WESTERN CANADA RAILWAY CLUB.—L. Kon, Immigration Agent, Grand Trunk Pacific, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Building, Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Grand Pacific Hotel, Chicago.

WESTERN SOCIETY OF ENGINEERS.—E. N. Layfield, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings. Annual meeting, 1st Wednesday after 1st Thursday in January, Chicago.

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF DECEMBER, 1915.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total (inc. misc.)	Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Atlantic & St. Lawrence	167	193,288	22,694	233,537	32,690	43,400	4,057	83,258	.....	4,847	168,252	65,285	11,505	53,780	—9,403
Central of New Jersey	681	2,159,865	446,232	2,771,985	204,931	496,006	26,464	998,989	11,320	54,322	1,789,369	982,616	273,665	708,587	199,734
Central Vermont	411	249,047	64,314	343,669	32,138	57,207	7,244	153,798	2,111	7,837	260,335	83,334	15,590	67,744	39,981
Cincinnati, Hamilton & Dayton	622	627,274	82,718	799,204	121,145	169,583	13,605	277,034	3,001	36,510	618,799	180,406	32,492	147,908	165,394
Denver & Salt Lake	255	141,509	17,345	164,715	18,716	36,642	1,434	66,986	.....	3,991	127,769	36,946	8,008	28,938	—14,558
Detroit, Grand Haven & Milwaukee	191	185,001	36,539	264,979	31,668	28,738	5,088	137,355	629	4,347	207,825	57,154	3,220	53,307	22,386
Erie	1,988	4,170,318	737,406	5,420,190	243,712	533,237	94,395	2,005,113	33,007	123,038	3,029,500	2,390,689	103,690	2,286,651	1,977,309
Grand Trunk Western	347	464,730	156,847	662,548	102,466	106,904	14,089	265,955	5,325	13,976	508,715	153,833	32,970	120,787	117,553
Michigan Central	2,200	2,258,685	838,158	3,531,230	377,246	562,006	65,636	1,234,344	63,981	68,894	2,372,107	1,159,124	157,936	999,465	477,119
Minneapolis & St. Louis	1,646	759,306	162,711	973,952	27,299	128,475	16,972	358,503	171	23,030	554,450	419,502	41,093	377,934	122,866
New York Central Railroad	5,969	11,242,194	3,927,306	17,519,140	1,238,263	3,780,519	223,282	5,575,286	254,241	399,213	11,470,804	6,048,336	514,658	5,532,110	Not shown
New York, Susquehanna & Western	140	216,195	54,720	310,226	2,837	26,082	2,051	153,516	.....	6,320	190,780	119,445	7,404	112,005	—21,755
Oahu Railway & Land Co	114	45,155	19,829	70,174	8,964	9,317	650	21,365	.....	3,734	44,030	26,145	11,024	15,120	—4,810
Oregon Short Line	2,259	1,618,893	338,048	2,106,822	205,242	238,814	31,289	470,158	28,187	52,667	1,026,187	1,080,634	159,158	920,932	342,866
Oregon-Washington R. R. & Nav. Co.	2,028	979,083	336,507	1,428,255	301,819	162,297	40,776	466,445	11,683	56,719	1,034,762	393,493	128,431	264,815	—6,806
Pittsburg & Lake Erie	225	1,558,496	146,190	1,821,670	133,328	230,162	18,103	415,138	4,365	28,616	828,812	992,858	49,422	943,425	819,266
Spokane, Portland & Seattle	555	272,586	99,245	405,341	32,853	33,716	7,424	91,417	3,324	13,693	181,929	223,412	53,400	169,589	69,076
Toledo & Ohio Central	436	356,538	49,948	434,171	51,590	86,963	6,931	172,549	1,832	9,877	329,742	104,428	38,635	65,581	48,553
SIX MONTHS OF FISCAL YEAR 1916															
Atlantic & St. Lawrence	167	633,933	154,450	860,274	140,747	136,128	22,626	362,278	.....	23,542	685,321	174,952	69,030	105,912	—14,344
Central of New Jersey	681	12,471,570	3,361,451	16,798,725	1,358,108	2,919,363	197,965	5,548,120	81,184	336,245	10,438,289	6,360,436	858,599	5,501,473	771,450
Central Vermont	411	1,401,173	503,415	2,078,770	254,137	342,636	52,911	856,292	12,721	42,507	1,561,204	517,566	93,540	424,009	146,626
Cincinnati, Hamilton & Dayton	939	4,444,799	805,832	5,867,011	944,871	1,115,971	108,099	2,066,933	21,108	141,122	4,390,943	1,476,068	197,301	1,277,582	519,019
Cumberland Valley	164	1,267,570	346,007	1,699,226	185,936	180,305	24,576	511,170	4,813	53,104	959,904	739,323	35,271	704,049	321,411
Delaware, Lackawanna & Western	955	17,590,472	4,519,680	24,406,412	2,479,545	3,509,691	436,959	7,348,607	188,763	474,201	14,403,430	10,002,982	995,734	9,006,216	1,386,793
Denver & Rio Grande	2,575	9,481,504	3,026,065	13,512,921	1,545,985	2,135,193	242,146	3,476,845	281,357	294,959	7,976,483	5,536,438	543,000	4,992,724	1,351,293
Denver & Salt Lake	255	839,580	191,763	1,076,828	118,869	180,986	12,312	356,736	.....	27,701	696,493	380,336	47,453	332,720	28,253
Detroit & Mackinac	393	357,276	169,099	569,304	63,902	93,008	11,917	194,915	892	16,177	380,810	188,494	51,422	137,072	16,413
Detroit & Toledo Shore Line	81	780,741	.....	785,869	74,652	47,443	9,095	203,241	.....	16,198	350,628	435,241	33,450	401,791	72,565
Detroit, Grand Haven & Milwaukee	191	1,094,001	325,439	1,642,090	142,249	175,119	32,583	700,495	4,313	25,262	1,080,021	562,068	22,620	538,954	347,392
Detroit, Toledo & Ironton	441	929,109	89,736	1,090,619	115,301	145,255	23,330	433,129	.....	36,282	753,297	337,321	33,500	303,787	265,790
Duluth & Iron Range	288	3,644,078	119,051	3,873,188	333,169	441,167	8,156	848,633	6,767	73,004	1,710,896	2,162,292	211,570	1,949,635	928,500
Duluth, Missabe & Northern	399	6,368,334	163,389	6,810,206	559,014	683,089	12,569	994,339	53,141	89,546	2,391,698	4,418,508	384,571	4,033,938	2,554,517
Duluth, South Shore & Atlantic	628	1,126.056	481,391	1,770,951	287,627	205,309	43,573	587,437	22,909	53,325	1,200,181	570,770	133,868	436,821	248,833
Duluth, Winnipeg & Pacific	187	554,775	109,974	690,715	79,553	77,116	9,717	229,412	4,042	33,796	433,635	257,080	34,611	222,469	156,760
Elgin, Joliet & Eastern	789	5,869,259	72	6,258,160	453,167	1,029,563	39,497	1,620,723	.....	140,458	3,282,983	2,975,177	222,314	2,752,673	1,371,156
El Paso & Southwestern Co	1,027	3,861,866	811,759	4,973,780	761,168	652,362	107,614	1,235,004	38,898	179,364	2,974,284	1,999,495	239,011	1,760,306	496,768
Erie	1,988	25,268,329	4,877,100	33,050,972	2,430,430	4,441,140	543,717	10,796,173	202,699	655,040	19,006,594	14,044,378	940,000	13,069,879	6,944,393
Florida East Coast	745	1,566,298	629,897	2,529,334	395,669	357,723	52,418	897,285	16,568	116,045	1,817,304	712,030	135,701	576,152	157,127
Fort Worth & Denver City	454	2,095,703	868,947	3,115,335	371,445	487,618	39,136	882,609	16,831	92,542	1,890,180	1,225,154	108,530	1,116,624	235,500
Galveston, Harrisburg & San Antonio	1,351	4,540,392	1,664,699	6,545,249	871,002	831,028	176,624	2,302,653	65,454	192,649	4,432,459	2,112,789	305,435	1,804,109	830,849
Galveston Wharf	13	.....	.....	665,448	31,916	12,665	2,460	179,594	283,173	2,366	512,174	153,275	56,090	97,185	—241,081
Georgia	307	1,053,974	408,867	1,578,837	136,359	249,405	75,227	598,774	590	45,325	1,105,581	473,256	105,334	367,544	130,078
Georgia, Southern & Florida	395	715,400	344,738	1,212,848	134,923	208,167	40,346	442,705	186	58,311	884,540	328,308	63,243	264,266	112,021
Grand Rapids & Indiana	575	1,711,419	914,788	2,864,397	287,772	422,050	65,287	1,089,690	12,994	86,768	1,964,560	899,837	128,608	769,576	116,801
Grand Trunk Western	347	3,064,930	918,847	4,265,892	452,053	650,645	94,765	1,459,164	33,891	77,157	2,767,675	1,498,217	197,820	1,300,043	955,210
Great Northern	8,102	33,810,262	7,656,704	45,358,099	3,575,491	4,069,997	563,384	10,787,785	452,889	660,292	20,008,515	25,349,583	2,614,585	22,733,210	3,845,888
Gulf & Ship Island	308	714,770	179,078	978,311	91,189	157,478	17,281	224,374	1,673	39,418	531,414	446,898	42,700	403,928	182,825
Gulf, Colorado & Santa Fe	1,938	6,033,224	1,716,174	8,188,659	1,695,972	1,200,581	173,746	3,633,228	.....	225,030	6,896,788	1,291,871	379,613	909,325	—1,928,197
Hocking Valley	351	3,051,108	457,748	3,799,943	375,839	691,893	49,849	1,060,865	.....	87,180	2,265,627	1,534,316	224,400	1,309,910	380,193
Houston, East & West Texas	191	516.626	175,295	737,898	156,344	109,784	11,983	237,549	4,015	19,055	538,442	199,455	22,294	176,972	87,051
Houston & Texas Central	895	2,569,967	797,264	3,622,745	497,277	555,301	92,948	1,153,945	34,865	112,253	2,442,640	1,180,106	177,207	1,001,598	325,106
Illinois Central	4,767	24,786,082	6,922,503	34,316,361	5,196,713	8,157,264	620,572	10,758,759	178,037	873,224	25,726,154	8,590,207	1,673,100	6,907,234	613,760
Indiana Harbor Belt	110	.....	.....	1,876,083	206,256	153,199	16,786	718,207	.....	47,025	1,141,473	734,610	45,452	688,059	212,943
International & Great Northern	1,159	3,522,324	958,245	4,832,731	737,648	776,805	122,939	1,859,984	21,247	173,506	3,619,907	1,212,824	198,795	1,013,091	375,594
Kanawha & Michigan	177	1,572,599	194,549	1,813,286	251,163	348,169	19,322	458,289	96	40,806	1,117,845	695,441	78,520	616,921	222,151
Kansas City, Mexico & Orient	738	1,075,270	222,109	1,366,164	342,166	270,054	52,708	546,442	.....	61,818	1,273,187	92,977	74,262	18,699	—253,674
Kansas City Southern	837	4,069,620	771,196	5,328,850	607,985	571,134	165,272	1,633,599	.....	208,358	3,119,702	2,209,148	271,733	1,934,926	325,946
Lake Erie & Western	900	2,905,707	398,479	3,473,508	400,086	650,976	74,834	1,129,127	.....	75,674	2,330.698	1,142,810	146,803	995,534	453,036
Lehigh & Hudson River	97	932,546	60,290	1,094,789	123,038	135,144	9,139	339,035	.....	24,472	630,828	463,961	26,800	437,161	171,759
Lehigh & New England	296	1,698,569	7,373	1,796,458	227,794	189,090	11,052	408,046	.....	32,758	868,728	927,730	37,200	890,530	296,833
Lehigh Valley	1,442	20,510,218	2,301,665	24,241,217	2,686,347	4,834,547	506,885	8,214,701	75,543	438,786	16,742,200	7,499,017	844,000	6,653,332	930,024
Long Island	398	2,029,633	4,504,242	7,500,780	754,115	736,275	74,910	2,854,467	36,784	189,701	4,646,231	2,854,549	468,952	2,381,073	110,321
Louisiana & Arkansas	279	753,152	96,430	874,397	153,819	138,901	18,981	215,165	.....	23,847	550,713	323,684	45,000	278,684	41,301
Louisiana Ry. & Navigation Co	351	946,665	184,459	1,204,234	175,987	173,009	37,978	374,276	.....	29,733	790,984	413,250	57,000	356,170	176,064
Louisiana Western	208	807,784	331,019	1,216,237	154,570	200,328	42,175	321,860	11,495	36,580	766,957	449,280	55,122	393,940	81,092
Louisville & Nashville	5,038	21,557,321	5,697,353	29,265,242	4,235,873	5,277,845	724,956	8,485,031	143,371	620,696	19,440,702	9,824,540	1,141,057	8,670,096	3,211,081
Louisville, Henderson & St. Louis	200	518,886	220,227	781,613	188,782	103,393	30,836	233,728	.....	19,442	576,181	205,433	22,800	182,442	23,706
Maine Central	1,220	3,620,207	1,911,947	5,985,105	853,950	827,704	70,969	2,093,976	32,039	170,087	4,047,745	1,937,360	320,358	1,616,794	233,501
Michigan Central	2,200	12,417,327	5,233,149	19,982,135	2,428,135	3,010,739	370,175	6,735,619	304,571	374,350	13,223,590	6,759,022	793,936	5,962,044	1,935,326
Midland Valley	380	667,451	202,052	918,893	169,302	121,768	14,002	288,417	.....	35,376	628,866	290,027	36,536	253,108	111,643
Minneapolis & St. Louis	1,646	4,173,793	1,038,466	5,524,127	588,151	753,920	105,299	1,928,479	555	129,957	3,506,360	2,017,767	213,592	1,802,120	280,711
Minn., St. Paul & Sault Ste. Marie	4,229	13,725,386	3,493,412	18,558,375	1,728,513	2,011,830	329,520	5,086,861	104,519	345,869	9,592,374	8,966,002	861,933	8,104,060	2,575,364
Missouri & North Arkansas	365	397,535	180,953	620,389	169,395	132,429	16,615	211,351	.....	32,698	562,488	57,900	34,754	22,611	86,311

Traffic News

The Merchants Association of New York City, through its executive committee, has expressed disapproval of the proposal before Congress (Senate bill 580) requiring common carriers to transport ordinary freight with reasonable despatch and live-stock at not less than 20 miles an hour; and has expressed approval of House bill 201 designed to put a time limit against long deferred collection of underchanges by railroads; of House bill 545, in so far as it applies to the collection of freight bills, forbidding carriers to extend credit beyond 90 days. Concerning House bill 563, to regulate the issue of securities by common carriers and to give the Interstate Commerce Commission power to examine carriers' correspondence, the association voted to take no action.

The Post Office Department has asked for bids for carrying mails over eight routes by aeroplane, with the expectation of beginning the service next October. A chief purpose of this move is to stimulate the development of aviation in the interest of the military service. One of the routes is in Massachusetts, and the others are in Alaska. In Massachusetts the call is for service between New Bedford and Nantucket, 56 miles. Nantucket, on an island about 30 miles from the main land, has a population of about 3,000. An aeroplane is wanted which can carry 3,000 lb. The Alaskan routes are from Seward to Nome, thence to Fairbanks and back to Valdez. Most of them call for a service twice a week throughout the year. On some of the routes the cost at present is as high as $100,000 a year, and in winter six weeks is required to make the trip.

American-Hawaiian Steamship Company Suspends Service

According to reports from San Francisco, on account of the closing of the Panama Canal by slides, 300,000 tons of raw sugar is at San Francisco or in the vicinity awaiting shipment to Atlantic seaboard refineries by rail. The Southern Pacific has applied to the Interstate Commerce Commission for permission to put into effect on short notice an emergency rate of 50 cents per 100 lb. This rate would make the total revenue from the shipment approximately $3,000,000, and it is estimated that it will require 7,400 cars, or 185 trains of 40 cars each. The American-Hawaiian Steamship Company, which, since the closing of the canal, has been operating from South America to the Straits of Magellan, has issued a circular saying that since it appears that the canal will not be opened for several months, and because it has not been getting enough business via the straits to justify the expense, it has finally decided to discontinue the service, and will not be in a position to transport any cargo from the Atlantic to the Pacific coast until the conditions have been changed.

Car Surpluses and Shortages

The American Railway Association committee on relations between railroads has issued Statistical Statement No. 13, giving a summary of freight car surpluses and shortages for February 1, 1916, with comparisons, as follows:

Total surplus	February 1, 1916	52,449
	January 1, 1916	70,391
	February 1, 1915	227,473

The surplus for January 1, 1916, shown above, includes figures reported since the issue of Statistical Statement No. 12.

Almost one-half of box car surplus of 12,793 cars is in the Southeast; very little in any other one section. The surplus of other equipment is distributed over the entire country, the largest amount being on the Pacific coast:

Total shortage	February 1, 1916	30,964
	January 1, 1916	23,310
	February 1, 1915	832

The shortage for January 1, 1916, shown above, includes figures reported since the issue of Statistical Statement No. 12.

The total shortage is approximately 7,500 greater than January 1. The most important box car shortage is west of Chicago, with smaller shortages in adjoining territory. The principal coal car shortage is in the East.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

Marble from Rutland, Vt.

Opinion by Commissioner Hall.

The carriers have justified an increase of 4.1 cents in the rate on marble, sawed, hammered, chiseled or dressed, in carloads from Rutland, Vt., and points of origin taking the Rutland rates via the Union Line route to St. Paul and points taking the St. Paul rates. The resulting rate of 30 cents is the same as the rates in effect over other lines and routes. A rate of 30 cents on rough quarried marble is found unreasonable in that it exceeds 28 cents, the aggregate of the immediate rates. (38 I. C. C. 12.)

Lumber from California and Southern Oregon

Big Basin Lumber Company et al. v. Southern Pacific et al. Opinion by Commissioner Hall:

The commission finds that the complainants have not sustained their contention that the rates on lumber and forest products from points in California and southern Oregon to various destinations east of the Missouri river are unreasonable or discriminatory as compared with the rates from competing points in Oregon and Washington, in the "inland empire" and in Mexico. The complainants were particularly interested in the rates on pine. They operate in the Coast, Truckee, Hawley, Blinzig, Virgilia and Keddie groups in California, Nevada, Oregon and Utah, but most of them are in the Coast group in California and southern Oregon. (37 I. C. C., 730.)

Rates Through Paducah, Ky.

Paducah Board of Trade vs. Chicago, Burlington & Quincy. Opinion by Commissioner Meyer:

Cairo is at the extreme southern end of Illinois near the confluence of the Mississippi and the Ohio rivers. Paducah is on the south bank of the Ohio, 42 miles east of Cairo. The rates on the various classes and on nearly all commodities from the north to Paducah are generally two cents per 100 lb. higher than the rates to Cairo, while the class and commodity rates to the south are the same from Cairo as from Paducah.

The commission finds that as far as through rates are concerned this arrangement is discriminatory. The evidence of record confirms the previous finding that Cairo and Paducah are so similarly situated that the rates through Paducah should not exceed the rates through Cairo. Points in the territory immediately north of Cairo as far as Carbondale, Ill. (57 miles north of Cairo), are so much nearer to Cairo than to Paducah that higher rates from those points to Paducah may be warranted. The Illinois Central Railroad, being the only carrier which serves both Cairo and Paducah from the north and from the south, and the carrier chiefly responsible for the present adjustment, will be ordered to maintain class and commodity rates from points in central freight association territory, including points in Illinois north of Carbondale, and western trunk line territory via Paducah to points in Tennessee on and west of its line extending from Fulton, Ky., through Corinth, Miss. The commission is unable to find on the present record, however, that the present difference of 2 cents per 100 lb. between the rates from the north to Paducah and Cairo is excessive. In some instances the Ohio river bridges are owned by separately incorporated companies, and the rail carriers are obliged to pay more than 2 cents per 100 lb. as a bridge toll. In the previous cases in which the commission has considered the Ohio river adjustment, it has usually left it to the carriers to decide whether the discrimination which was found to exist should be eliminated by imposing uniform bridge charges in both directions or by absorbing them in both directions. It pursues the same policy in the present case.

The commission also finds that the refusal of the defendants to

permit the milling or handling of grain in transit at Paducah, under the through rates from points in central freight association territory, including points in Illinois north of Carbondale, and western trunk line territory, to points in Kentucky on and east of the line of the Illinois Central Railroad extending from Paducah to Fulton, Ky., and to points in southeastern territory and Mississippi Valley territory, and to points in the state of Tennessee, upon the same terms and conditions as are concurrently provided for the milling or handling of grain in transit at Cairo, Ill., under the through rates from the same points of origin to the same points of destination, results in unjust discrimination against Paducah.

Commissioner Daniels dissents from the finding relative to the rates on grain. (37 I. C. C. 760.)

Paducah Board of Trade vs. Abilene & Southern et. al. Opinion by Commissioner Meyer:

In constructing their class and commodity rates from the territory east of the Mississippi River to points in Arkansas, Oklahoma, Louisiana, and Texas the defendants have placed Paducah, Ky., in "Nashville territory" and Cairo, Ill., in "St. Louis territory," the rates from the former territory being materially higher than the rates from the latter. The commission holds that this adjustment gives the manufacturers and jobbers located at Cairo an undue advantage over their Paducah competitors, and the carriers are required to establish class and commodity rates from Paducah to points in the southwest not in excess of those contemporaneously in effect from Cairo to the same points. (37 I. C. C. 760.)

STATE COMMISSIONS

The Mississippi Railroad Commission has granted permission to the Pascagoula, Moss Point & Northern, which is leased to the Alabama & Mississippi, to charge a passenger rate of 4 cents a mile, instead of 3 cents, the statutory rate, beginning March 1 and effective for one year.

COURT NEWS

In the United States District Court at Philadelphia, February 12, a preliminary injunction was granted restraining the government from interfering with the Lehigh Valley Railroad in the operation of its vessels on Lake Erie. This suit is the protest of the railroad company against the order of the Interstate Commerce Commission requiring the railroad and the water line to be divorced one from the other; and March 17 has been fixed by the court as the day for argument on the injunction.

The United States Court at San Francisco on February 7 decided that the Southern Pacific cannot be forced to sell at $2.50 an acre land acquired under the congressional land grant of 1871. The question was presented to the court in a petition of a man who had filed upon a half section of land in the Imperial valley, and demanded that the railroad accept $2.50 an acre.

The third court of civil appeals at Austin, Tex., has allowed a writ of error to the United States Supreme Court in the case of the Missouri, Kansas & Texas against the state of Texas, which involves the validity of the railroad commission's order requiring railroads to run another train (starting on time) when a passenger train is more than 30 minutes late at junction points.

The attorney general of Missouri last week filed an intervening petition in the Missouri, Kansas & Texas and Missouri Pacific receiverships in the federal district court at St. Louis, seeking to recover excess fares paid by state officers during the litigation of the state rate laws. The amounts asked are $6,200 from the Missouri Pacific and $18,900 from the Missouri, Kansas & Texas.

Carriage of Intoxicating Liquors

The North Carolina prohibition act in section 1 makes it unlawful to ship, carry, or deliver in any one package or at any one time from a point within or without the state to any person in the state any intoxicating liquors in a quantity greater than one quart. Section 2 makes it unlawful for any person to receive more than one quart. Section 3 makes it unlawful for any person during 15 consecutive days to receive more than one quart. The North Carolina Supreme Court holds that this statute is a legitimate and reasonable exercise of the police power of the state, and that under it and the Webb-Kenyon act, an express company which had brought into the state and delivered to a person a quart of whisky was not liable for refusing to deliver another quart to him on the following day, or for refusing to accept at a point in another state a consignment of a gallon of whisky to him in the state of North Carolina.—Glenn v. Southern Express Co. (N. Car.), 87 S. E., 136.

Leaving Train in Motion

A passenger, riding to a town in the evening, felt that the train was stopping, heard the brakeman call his station, and thereupon went upon the platform. He then left the train, which was in fact in motion, and was injured by falling on a cattle guard. In an action for his injuries the Michigan Supreme Court held the railroad was not liable. The calling a station before the train is actually at it is a customary and proper practice, and passengers must at their peril inform themselves concerning the every day incidents of railroad traveling, such as whether a train is at a station and in fact stopped.—Hooker v. Blair (Mich.), 155 N. W., 364.

Refusal to Trace Freight

A Georgia statute makes it the duty of either the initial or connecting carrier, on proper application, to trace freight which may have been lost, damaged, or destroyed, and to give a suitable answer, in writing, within 30 days, failure making the carrier liable for the value of the freight. The Georgia Supreme Court holds that the liability of the railroad under this statute is not incidental to the transportation of the freight. It is in the nature of a penalty, prescribing damages for noncompliance with a statutory duty. When the railroad refuses to trace the goods and give the information, it makes itself liable to the shipper by the refusal independently of its contract.—Farkas v. Georgia S. & G. (Ga.), 87 S. E., 160.

What Constitutes a Passenger

A person who goes to a flag station at which passenger trains are accustomed to stop to take on passengers on being signaled, and gives a proper signal to stop, does not, the Georgia Supreme Court holds, ipso facto become a passenger, and a charge to the jury to that effect was held reversible error in an action for injuries sustained through his foot catching under a rail while he was trying to leave the track.—Georgia & Florida v. Tapley (Ga.), 87 S. E., 473.

Negligence of Railroad's Physician

The Indiana Supreme Court holds, following the general rule, that a railroad company is not liable to an employee for the negligence of a physician called by it to render medical or surgical aid to such employee, if the company was not negligent in selecting and employing an incompetent and unskilled physician, but only if it has knowledge of his incompetency.—Boring v. Chicago & Erie (Ind.), 110 N. E., 545.

Grant of Right of Way—Parol Agreement

A landowner conveyed to the East & West Ry. Co. of Alabama a right of way over her land, on which tracks were laid, and over which the company voluntarily for several years kept in repair two crossings. Subsequently this company was absorbed by the Seaboard Air Line, to which the woman conveyed in fee simple an additional strip of land. An action was brought against the Seaboard Air Line by her heirs to recover damages to the land because of an increased elevation of the embankment, the destruction of one of the crossings, and the impairment of the other, alleged to be in violation of a parol agreement between the original landowner and the Seaboard Air Line, made contemporaneously with her conveyance, with respect to the height of the embankment and the preservation of the crossings. The

Georgia Supreme Court held that the action, being for the breach of a parol agreement which by its terms attempted to ingraft a condition on the grantor's deed, was properly dismissed on demurrer.—Hutchens v. S. A. L. (Ga.), 87 S. E., 28.

Switch Track Accident

Certain cars were placed on a track in a mill yard in such a position as to allow employees to pass between them. A train backed into the yard without warning or lookout, and the track was curved so that its approach could not be seen. The North Carolina Supreme Court holds that the trainmen were guilty of negligence and that one caught between two of the cars between which he was thus invited to pass might recover against the railroad for his injuries. He was not guilty of contributory negligence, even though by going about 100 feet he might have passed around the cars.—Le Gwin v. A. C. L. (N. Car.), 87 S. E., 99.

Killing Trespassing Animals

Action was brought for the value of four valuable horses killed by a train on the defendant's spur track. The accident happened on an ascending grade and the engineer was sanding the track. The track was not fenced. In the absence of contract stipulation or express statutory provision, a railroad company is not required to fence its right of way. The West Virginia statute requires such inclosure only when the way is acquired by condemnation. The West Virginia Supreme Court held that the paramount duty of railroad employees is to protect the property intrusted to them by the railroad, and that subordinate thereto is the duty to exercise reasonable or ordinary care to prevent injury to stock. The evidence showed that the engineer did not see the horses and that great difficulty was being experienced in hauling the 24 cars of coal train up the steep grade. It was held that negligence of the railroad was not proved.—Starks v. B. & O. (W. Va.), 87 S. E., 88.

Use of Rights of Way for Private Purposes

A number of citizens of the town of Frost, Tex., sued the St. Louis South Western to restrain it from leasing to a lumber company a portion of its right of way in the town. The railroad had originally acquired from the owner of the land the right to construct and forever operate its railroad over and across the land, which right should be forfeited in the event of the company's failure to construct and operate the road. After this grant of the right of way, the owner sold the fee of her lands to a third person, who in turn conveyed it to another. The second grantee, who held the fee, plotted the town of Frost on the property, and conveyed to the railroad an enlarged right of way and a parcel of land for a station. It was held by the Texas Court of Civil Appeals that this grant, which used the words "grant, sell and convey," made the railroad owner of the fee to its right of way, and could use portions of it for any purpose desired regardless of the limitations in the first grant.—Stephenson v. St. Louis South Western (Tex.), 181 S. W., 568.

Grant of Land for Side Track

In a suit to recover possession of land occupied by a railroad's side track it appeared that the plaintiff, in consideration of $1 and the construction of the track, granted to the railroad the right to enter upon her premises and maintain the track. The agreement provided that the track should not be used for the storage of cars, and gave the railroad the right, without compensation, to remove the material belonging to it and used in the construction of the track, and to hold to the railroad, its successors and assigns, while they should elect to continue the use of the track for the use of the plaintiff's business. It also provided that after the removal of the material all right, title and interest of the railroad in the plaintiff's premises should cease and determine absolutely. The Indiana Appellate Court holds that this was "a grant to use and occupy," and not, as claimed by the plaintiff, a lease creating a tenancy at will, terminable by a month's notice to quit.—P., C., C. & St. L. v. Barth (Ind.), 110 N. E., 574.

Telegraph Company's Use of Right of Way

The Western Union Telegraph Company, which, with its predecessors had for many years maintained its lines over the right-of-way of the Atlanta & West Point, entered into a new contract with it to continue seven years, and after that until terminated by a year's notice. By one clause of the contract the telegraph company was granted and assured a right-of-way over the railroad, to be exclusive as far as the railroad could legally make it so, with the right to put up additional wires, etc. In a suit to enjoin the railroad for removing the wires and poles, the Federal District Court, N. D. Georgia, holds that, whatever right of occupancy the telegraph company previously had, the contract, voluntarily entered into, measured its future right, which ended when the contract terminated in accordance with its terms. The Federal statute of 1913, giving telegraph companies which accept its provisions the right to construct their lines over the public lands and over any military post road of the United States, does not vest such a company with any power of eminent domain, nor confer upon it the right to construct its lines over private property, or the right-of-way of any railroad company without consent of the owner.—Western Union v. A. & W. P., 227 Fed., 465.

Duty to Furnish Tank Cars

The Interstate Commerce act defines "transportation" as including cars, and provides that "it shall be the duty of every carrier . . . to provide and furnish such transportation upon reasonable request therefor. The Federal District Court, W. D. Pennsylvania, holds that such duty to provide and furnish cars is no broader than that imposed by the common law, and the act does not empower the Interstate Commerce Commission, upon a determination that tank cars are reasonably necessary to a proper car service, to order a railroad company to provide and furnish tank cars for use by an oil refinery, where the company does not possess such cars, or not in number sufficient to meet the requirement.—Pennsylvania v. United States, 227 Fed. 911.

Exchange Tracks Where Probable Loss Shown

In proceedings before the Missouri Public Service Commission to compel the C. B. & Q. and the Wabash to construct and maintain an exchange track at Macon, the track was ordered by the commission. The C. B. & Q. brought certiorari, and the Circuit Court affirmed the order. That judgment is now reversed by the Missouri Supreme Court, sitting as a court of equity. After reviewing the evidence, tending to show that the cost of construction would be over $15,000, the cost of right of way $12,000, and the annual cost of operating $500; and the evidence showing the probable earnings, the court came to the conclusion that, instead of there being a profit, there would be a loss of $200, or more, yearly; and that the railroad should not have to bear this unjust burden.—C. B. & Q. v. Public Service Commission (Mo.), 181 S. W., 61.

Assumption of Risk

Bridge repairers engaged in removing defective piling from under a bridge sawed off the piles at the ground, loosened them from the drift bolts that held them at the top, and allowed them to fall to the ground. While one of the gang was attempting to loosen one of the piles it suddenly came loose, fell, and injured him. The reason why the pile came loose before it was expected to was that it was cracked and rotten at the top where the bolt entered. The man knew that the piles were rotten and unsafe for use, and that they were being removed for that reason. He did not know that the particular pile which injured him was rotten at the top. In an action against the company under the Federal Employers' Liability Act, the Minnesota Supreme Court holds that the company did not owe the plaintiff the duty to warn him of the particular defect in this pile. The plaintiff assumed the risk of it, and was precluded from recovering for an injury caused by it. Under the Federal Employers' Liability Act assumption of risk is still a defense, except in cases where the violation by the railroad of "any

statute enacted for the safety of employees contributed to the injury or death of such employee."—Marshall v. C. R. I. & P. (Minn.), 155 N. W., 208.

Damages for Leased Land Taken

A 20-year lease of land conferred upon the lessee a right to build railroads in furtherance of its business. The lessee permitted a railroad company to lay its main line on the land, and build stations and side tracks thereon. In an action by the owner of the land for damages it was held by the North Carolina Supreme Court that, under the restricted terms of the lease the lessee had no right to permit a railroad to construct a line for general use. The railroad was liable to the owner for the value of the entire property covered by the right-of-way and also for damages to the remainder of the land, even conceding that the lessee had power to permit the construction. But in estimating the amount of permanent damages to be allowed the owner, the fact that he had given such a lease might be considered.—McMahan v. Black Mountain (N. Car.), 87 S. E., 237.

"Switching Service" Defined

Section 8,998 of the Ohio General Code requires a railroad, whose tracks lie contiguous to side tracks suitable for loading or unloading, to switch the cars of other railroads to and from the side tracks without demurrage for 48 hours. Section 9,000 fixes rates for switching. For 2½ to 5 miles, maximum two dollars a car. In an action by the owners of a lumber yard in Cincinnati for the difference between this charge of $2 and $6 charged by the company, the latter claimed that the service was not switching service, but transportation between a local station on another line, Fernbank, on the Cleveland, C. C. & St. Louis, and a local station on its own line, i.e., the plaintiff's siding. Fernbank is within the switching limits of Cincinnati. The Ohio Supreme Court held that a "switching service," within the meaning of the two sections mentioned, is one which precedes or follows a transportation service, and applies only to a shipment on which legal freight charges have already been earned or are to be earned. In this case the movement was not a switching service, but a transportation service, for which a reasonable freight rate could be charged. It was not incidental to the shipment as a whole, but was a part of it.—Doppes Sons Lumber Co. v. C. N. O. & T. P. (Ohio), 110 N. E., 640.

What Constitutes "Right of Way" for Taxation

In an appeal by the C. B. & Q. from the action of a local board of equalization, the county contended that under no circumstances can the right of way extend more than 100 feet from the center of the main track, and that under the Nebraska law property not on this right of way must be assessed locally, and not by the state board. The Nebraska Supreme Court holds that, in view of the general purpose of the statute that the state board shall assess the railroad as an entity, including all of its property used in operating its road or carrying on its business, and, considering the language used in other sections of the statute, "right of way and depot grounds," as used in the statute, could not have been intended to exclude from the jurisdiction of the state board all property situated more than 100 feet from the center of the main track, and the county's contention was without merit.

It seldom happens, the court said, that a common expression has received such diverse construction and application, depending upon the particular circumstances of its use, as has the expression "right of way." Even when the right of way of a railroad company is defined, there is found to be a great variety of construction, depending upon the connection in which it is used. The Supreme Court of the United States in St. Louis, K. C. & C. v. Wabash, 217 U. S. 247, 30 Sup. Ct. 510, adopted the definition of the term by the Circuit Court of Appeals in the same case, as follows: "The ordinary significance of the term 'right of way,' when used to describe land which a railroad corporation owns or is entitled to use for railroad purposes, is the entire strip or tract it owns or is entitled to use for this purpose, and not any specific or limited part thereof upon which its main track or other specified improvements are located."—C. B. & Q. v. Box Butte County (Neb.), 155 N. W., 881.

Liability for Delay

On May 26, 1910, a produce exchange delivered to the New York, Philadelphia & Norfolk at Marion, Maryland, a carload of strawberries for transportation to New York City. They were delivered at destination some hours later than the customary time of arrival and action was brought to recover damages for the failure to transport and deliver with reasonable despatch. Judgment in favor of the shipper was affirmed by the Court of Appeals of Maryland. (122 Md. 215.) The railroad appealed to the Supreme Court of the United States, stating in its brief that the questions involved were two:

"1. Does the Carmack Amendment impose on the initial carrier liability for delay occurring on the line of its connection without physical damage to the property?

"2. Was the plaintiff entitled to recover because its shipment failed to arrive in time for the market of May 28, when the regulations under which the shipment moved were published in tariffs duly on file with the Interstate Commerce Commission and specifically provided: 'No carrier is bound to transport said property by any particular train or vessel or in time for any particular market, or otherwise than with reasonable despatch, unless by specific agreement endorsed hereon.'"

The Supreme Court (Justice Hughes) answered both questions in the affirmative. It stated that the language of the Carmack Amendment has been construed in decisions by courts of the following states as embracing damages for delay—Oklahoma, Mississippi, Texas, Virginia; but the contrary has been held in North Carolina.

As to the second point, the court accepted the finding of the jury that the carriers had not given "reasonable despatch"; that is to say, it approved the charge to the jury, in the trial court, to the effect "that it became the duty of the defendant and all connecting lines to use reasonable care, diligence and exertion in forwarding and transporting and delivering" the berries, and that if the jury should believe that the defendant and the connecting lines, or any of them, "did not use such care, diligence and exertion" and that by reason of the failure so to do the berries arrived "too late for the market of the day on which they would have arrived if they had been forwarded and transported with such care, diligence and exertion, and that the plaintiff thereby sustained loss, then their verdict should be for the plaintiff."—N. Y. P. & N. v. Peninsular Produce Exchange. Decided January 24, 1916.

Right to Remove Ties and Rails of Insolvent Road

A railroad became insolvent, and was sold by a receiver under order of court. The purchasers formed no corporation to carry on the business of the road, and had no right to continue its construction, the railroad having forfeited its right to extend its line. The state of Texas sought to enjoin the purchasers from removing the ties and rails. The Texas Court of Civil Appeals has reversed a judgment for the state and rendered judgment for the purchasers. "In order to operate a railroad," the court said, "it is necessary to keep the track in repair, to have rolling stock, to purchase fuel, and to pay the employees' wages. The appellants [the purchasers] have no rolling stock, and they could not pay the men out of the earnings of the road. Suppose the court should order them to buy rolling stock necessary for the operation of the road, and they should refuse to do so, what could the court do about it? Forfeit their charter? They have none. Appoint a receiver to operate the road? The court tried that and it proved a failure. Sell it? It is worthless, unless its material can be utilized as junk. The purchaser could not operate the road except at a loss, and of course would not do so. Put appellants in jail? Certainly not. If the court had the means of cempelling appellants to take money out of their pockets and invest the same in operating a railroad, which did not and never would pay operating expenses, as is admitted to be the case with the road in question, the exercise of such means would amount to confiscation, and would be violative of the constitutions of this state and of the United States."

The court overruled a motion for rehearing, saying: "A railway company, while a going concern, may be enjoined from violating its implied contract not to move its track. For failure

to operate its road, its charter may be forfeited. But, as we have stated in our previous opinion herein, the state has no power to compel anyone to operate a railroad, and when the owners have permanently ceased to do so, and thereby abandoned all of the privileges granted them by the charter, it has ceased to be a railroad in any proper sense."—Enid, Ochiltree & Western v. State (Tex.), 181 S. W., 493.

Scope of Federal Safety Appliance Act—Logging Cars

Section 6 of the federal safety appliance act declares that trains composed of four-wheel and eight-wheel standard logging cars, the height of the couplings of which does not exceed 25 inches, need not be equipped with automatic couplers. The Texas Court of Civil Appeals holds, in an action for violation of the state safety appliance act, that, as to a railroad engaged in interstate commerce, the federal regulations supersede the state laws relating to safety appliances on logging cars, even though such cars are used exclusively in intrastate commerce. Judgment for the railroad was affirmed.—State v. Orange & N. W. (Tex.), 181 S. W., 494.

Liability for Freight Conductor's Negligence

The conductor of a freight train, when informed that a brake beam was defective, neglected to stop the train, and the beam caught in the ties, derailing some cars, one of which struck and killed a trackwalker standing 10 or 15 feet from the track to let the train go by. The Kentucky Court of Appeals holds that the railroad was liable for the trackwalker's death.—C. N. O. & T. P. v. Strunk's Adm. (Ky.), 180 S. W., 528.

Time Limit on Claims for Damages

In an action against a railroad for damages to an automobile a plea alleged that under the contract the defendant should not be liable unless a claim was made in writing, within four months, and that such claim was not presented within four months, and that the damage to the automobile was peculiarly within the plaintiff's knowledge and unknown to the defendant. The Alabama Supreme Court held this to be a good plea.—N. C. & St. L. v. Cash (Ala.), 70 So., 269.

Interstate Commerce—Cattle Driven Over State Line and Shipped Back into State

A bill of lading for a shipment of cattle was executed on the Texas side of the boundary line between Texas and New Mexico. The cattle were then driven across the state line and loaded into pens in New Mexico for shipment to a point in Texas. In an action for delay in furnishing cars it was held by the Texas Court of Civil Appeals that the shipment was an interstate one.—Pecos. & N. T. v. Stimson (Tex.), 181 S. W., 526.

Spike Maul and Claw Bar "Simple Tools"

The Kentucky Court of Appeals holds that a spike maul and a claw bar used in pulling spikes from ties are simple tools, which a master is not bound to inspect, and that a section laborer of four years' experience, familiar with their use, and who knew that the head or top of the claw bar was battered and spread at the edges, and whose eye was injured by a splinter therefrom when it was struck by the spike maul, could not recover.—Hoskins v. L. & N. (Ky.), 181 S. W., 353.

Validity of Relief Association Contract

A railroad employee, on becoming a member of the relief department of the road, agreed that if any suit should be brought against the company for damages arising from or growing out of his injury or death, benefits otherwise payable should be forfeited, without any declaration or other act by the relief department or company. The employee was killed in service, and the railroad was held liable for his negligent killing. The South Carolina Supreme Court holds that it could not afterwards be held liable to his administratrix for any benefit which might be due to his estate as a member of its relief department. The contract was not void as against public policy as operating to relieve the railroad from liability for negligence.—McDaniel v. A. C. L. (S. Car.), 87 S. E., 145.

Railway Officers

Executive, Financial, Legal and Accounting

Edwin C. Washburn has been appointed special assistant to the president of the Baltimore & Ohio, with headquarters at New York.

E. S. Koller, general manager of the Colorado & Southern, at Denver, Colo., has been appointed also vice-president, succeeding A. D. Parker, resigned.

Operating

H. G. Odell has been appointed trainmaster of the Cherokee, Tulsa and Joplin divisions of the Missouri, Kansas & Texas, vice J. A. Young, assigned to other duties.

V. A. Riton, general superintendent of the Eastern general division of the Norfolk & Western at Roanoke, Va., who was granted leave of absence in January on account of ill health has resumed his duties as general superintendent.

J. T. Loree, superintendent of the Susquehanna division of the Delaware & Hudson, has been promoted to assistant general superintendent of transportation with office at Albany, N. Y., and T. J. Lynch has been appointed superintendent of the Susquehanna division vice Mr. Loree.

Harry Franklin Anderson, general superintendent of the Missouri, Kansas & Texas Railway of Texas, has been promoted to general manager. He was born in Schuyler county, Illinois, on March 21, 1865, and entered railway service in 1880 as a telegraph operator for the Wabash, St. Louis & Pacific. In 1883 he entered the employ of the Missouri Pacific as a despatcher, and was later promoted to chief despatcher for the same road. From 1887 to 1900 he was despatcher and chief despatcher for the Galveston, Harrisburg & San Antonio, and from 1900 to 1902 trainmaster for the same road. In 1902 he was promoted to assistant superintendent, and in May, 1904, was made superintendent of the Houston division, with office at San Antonio, Tex. In July, 1912, he became superintendent of the Missouri, Kansas & Texas, of Texas, at Denison, Tex.; he was promoted to the general superintendency of this road in October of the same year.

Traffic

B. F. E. Marsh, division freight and passenger agent of the Atchison, Topeka & Santa Fe at Topeka, Kans., has been promoted to assistant general freight agent, with office in the same city.

Charles D. Ellis has been appointed commercial agent for the Carolina, Clinchfield & Ohio, with office at St. Louis, Mo., and E. S. Hiner, commercial agent, with headquarters at Cincinnati, Ohio.

Paul E. Rogers, heretofore general agent for both the passenger and freight departments of the Atchison, Topeka & Santa Fe, with office at Atlanta, Ga., will represent the freight department only, in the future.

W. H. Amsden has been appointed commercial agent for the Carolina, Clinchfield & Ohio, with office at Toledo, Ohio. E. F. Elwell has been appointed commercial agent at Raleigh, N. C., and C. J. Nalle, commercial agent at Macon, Ga.

S. E. Dewey, commercial agent of the Grand Trunk at New York, has been appointed general eastern freight agent, with office at New York, and the positions of general agent and commercial agent, New York City, have been abolished.

Engineering and Rolling Stock

P. D. Fitzpatrick has been appointed valuation engineer of the Central Vermont with office at St. Albans, Vt.

T. D. Sedwick, chief chemist of the Chicago, Rock Island & Pacific, has been appointed acting engineer of tests in place of F. O. Bunnell, resigned.

F. G. Lister has been appointed mechanical engineer of the El Paso & Southwestern, with office at El Paso, Tex. Mr. Lister

previously served on the Spokane, Portland & Seattle and affiliated lines at Portland, Ore.

Purchasing

W. H. Farraday, chief clerk to the vice-president in charge of real estate, purchases and insurance of the Pennsylvania Railroad at Philadelphia, Pa., has been appointed an assistant purchasing agent. Mr. Farraday entered the service of the Pennsylvania Railroad in 1893, as a clerk in the purchasing department, and in April, 1911, became chief clerk to vice-president.

Special

Charles E. Webb, general agent of the Chicago & North Western at Houghton, Mich., has resigned to become secretary of the Michigan Association of Railways, with headquarters at Grand Rapids, Mich.

OBITUARY

C. I. Tuttle, assistant general freight agent for the Oregon Short Line at Salt Lake City, Utah, died on February 10, aged 59 years.

William L. Nicolls, who was chief engineer of the Long Island Railroad for a short time previous to 1880, died on February 14, in Philadelphia, Pa.

Silas W. Cummins, formerly general passenger agent of the Central Vermont, died on February 13, at his home in Boston, Mass., at the age of 73.

Albert Holt, formerly and for many years paymaster of the Boston & Albany, died at his home in Springfield, Mass., February 13, at the age of 84. Mr. Holt entered the service of the Western Railroad, now a part of the Boston & Albany, in 1858, and retired in 1901. He was succeeded by W. R. Holt, his son, who is the present paymaster.

Major George W. Vaughan, formerly chief engineer of the Santa Fe, Prescott & Phoenix, died on February 4, at his home in Leavenworth, Kan., aged 86 years. He was born in Genesee county, New York, and began his railway career in 1857, as a leveler on the Winona & St. Peter. He held many important engineering positions with various railroads during his long period of service, and was prominent in the construction of many new lines. Among the roads he was connected with as chief engineer are the Kansas Central, the Mexican Central, the Mexican National, the Leavenworth Northern & Southern, and the Santa Fe, Prescott & Phoenix. From November, 1893, to June, 1895, he was also vice-president and general manager of the last named road.

Alvah N. Brown, general traffic manager of the El Paso & Southwestern system, died at Los Angeles, Cal., on February 9, from paralysis of the heart. He was born on December 2, 1864, in Illinois, and entered railroad service in 1885 as a station agent for the Vandalia. From 1897 to January, 1899, he was traffic manager for the receivers of the St. Louis, Kansas & Southern; from January, 1899, to September 15, 1901, he was traffic manager and superintendent for the Kansas Southwestern at Arkansas, Kan. He entered the employ of the El Paso-Northeastern system in 1901 as general freight and passenger agent, and on May 26, 1905, became general freight agent for the El Paso & Southwestern system at El Paso, Tex. On May 1, 1909, he was made general freight and passenger agent for the same system, and on December 1 of the same year was promoted to general traffic manager.

SWISS RAILWAYS.—During the past year three important new lines have been completed—viz., first, a great tunnel with approaches under the Mont d'Or between Frasne and Vallorbe; secondly, the Moutier and Granges line, which appreciably abridges the running distance between Paris and Berne; and, thirdly, the Hauenstein tunnel on a line from Basle to Lucerne. The first line is 15 miles, the second 8½ miles, and the third 5 miles in length. Each of the three lines has involved the construction of an important tunnel, the first extending over 3¼ miles, the second 5½ miles, and the third 5 miles.—*Engineering, London.*

Equipment and Supplies

LOCOMOTIVES

THE CENTRAL OF BRAZIL is inquiring for prices on 30 Consolidation locomotives.

THE LAKE TERMINAL is inquiring for 4 six or eight-wheel switching locomotives.

THE PULLMAN COMPANY is inquiring for one four-wheel switching locomotive.

THE SIERRA RAILWAY OF CALIFORNIA is inquiring for prices on one Mallet (2-6-6-2) type locomotive.

THE BRITISH GOVERNMENT has given the Baldwin Locomotive Works an order for 20 four-wheel tank locomotives.

THE NEW YORK, CHICAGO & ST. LOUIS is expected to issue an inquiry shortly for a large number of locomotives.

THE ST. LOUIS & SAN FRANCISCO is understood to be considering the purchase of 30 Santa Fe type locomotives.

THE CENTRAL LOTERIA RAILWAY (Cuba) has ordered one Mogul type locomotive from the Baldwin Locomotive Works.

THE NEW YORK, ONTARIO & WESTERN is reported as contemplating the purchase of 6 locomotives, probably of the Santa Fe type.

THE CARNEGIE STEEL COMPANY has ordered one four-wheel switching locomotive from the Baldwin Locomotive Works. It is also in the market for from 4 to 7 six-wheel switching locomotives.

THE TEMISKAMING & NORTHERN ONTARIO, reported in the *Railway Age Gazette* of December 10 as inquiring for 2 Mountain type and 4 Consolidation locomotives, is now reported in the market for 6 Mikado type locomotives.

THE CENTRAL STEEL COMPANY has ordered one six-wheel switching locomotive from the American Locomotive Company. This locomotive will have 21 by 26 in. cylinders, 50 in. driving wheels and a total weight in working order of 158,000 lb.

THE CUBA RAILROAD, reported last week as having increased an order for 10 ten-wheel locomotives to 30 locomotives of that type, increased it instead to 35 locomotives. The additional 25 ten-wheel locomotives will have 20 by 26 in. cylinders, 56 in. driving wheels and a total weight in working order of 152,000 lb.

FREIGHT CARS

THE DENVER & SALT LAKE is inquiring for from 200 to 300 stock cars.

THE LAKESIDE & MARBLEHEAD is inquiring for prices on 150 to 200 50-ton self-clearing steel hopper cars.

THE ATLANTIC COAST LINE is inquiring for prices on 500 box cars, 500 flat cars and 100 steel underframes.

THE CUBA RAILROAD has ordered 350 flat, 350 box and 500 cane cars from the American Car & Foundry Company.

THE GARDEN CITY WESTERN, Kansas City, Mo., has ordered 15 general service cars from the American Car & Foundry Company.

THE CHESAPEAKE & OHIO has awarded a contract to the Central Locomotive & Car Works for the reconstruction of 300 box car bodies.

THE CHICAGO & NORTH WESTERN has issued inquiries for prices on 2,000 40-ton steel frame box cars; 1,000 40-ton steel frame automobile cars and 500 30-ton stock cars.

THE LACKAWANNA STEEL COMPANY, Lackawanna, N. Y., has ordered 700 50-ton hopper cars from the American Car & Foundry Company and 700 of the same type from the Standard Steel Car Company for its Ellsworth Colliery.

THE BALTIMORE & OHIO was reported last week as being about to build in its own shops the 500 refrigerator cars for which it recently issued inquiries. Although the company will build 500 refrigerator cars in its own shops, as mentioned, it will also purchase 500 cars from outside builders.

THE SOUTHERN PACIFIC has ordered 900 50-ton steel frame box cars, 760 40-ton steel frame stock cars, 650 50-ton steel flat cars and 275 flat car bodies from the Ralston Steel Car Company; 1,000 50-ton steel frame box and 250 50-ton all-steel gondola cars from the Haskell & Barker Car Company, and 3 caboose cars from the Mount Vernon Car Manufacturing Company.

PASSENGER CARS

THE AUSTRALIAN COMMONWEALTH is inquiring for prices on 5 first-class sleeping, 5 second-class sleeping, 3 dining and 3 club cars.

IRON AND STEEL

THE CENTRAL OF GEORGIA has ordered 10,000 tons of rail from the Tennessee Coal, Iron & Railroad Company.

THE KANSAS CITY SOUTHERN has ordered 1,300 tons of steel for the Ohio street bridge in Kansas City from the American Bridge Company.

THE SPOKANE, PORTLAND & SEATTLE has ordered 192 tons of steel for towers, machinery, etc., for a bridge at Harrisburg, Ore., from the Wisconsin Bridge & Iron Company.

THE DULUTH, MISSABE & NORTHERN has ordered 172 tons of steel for an extension to a highway over the Proctor Yard tracks at Proctor, Minn., from the American Bridge Company.

THE PENNSYLVANIA has given a contract to the Pennsylvania Steel Company for steel for one unit of the new bridge over the Ohio at Louisville. The bridge will consist of five units. This unit includes two spans and will cost about $250,000.

THE ATCHISON, TOPEKA & SANTA FE has ordered 241 tons of steel for a blacksmith shop at Albuquerque, N. Mex., from the Missouri Valley Bridge & Iron Company, and 241 tons of steel for a blacksmith shop at Topeka, Kan., from the Lackawanna Bridge Company.

MISCELLANEOUS

THE OREGON-WASHINGTON RAILROAD & NAVIGATION COMPANY is inquiring for prices on about 3,5000,000 ft. of fir.

THE CHICAGO, MILWAUKEE & ST. PAUL recently purchased 500,000 ties for use in spring maintenance of way operations.

PANAMA CANAL.—The general purchasing officer, Panama Canal, Washington, D. C., will receive proposals until 10:30 a. m., February 21, for cast iron car wheels, steel castings, lantern globes, rubber packing, canvas, and yellow pine box car roofing.

SIGNALING

THE MISSOURI PACIFIC has ordered from the Federal Signal Company 66 Federal Type 4A signals complete with all necessary relays, cable posts, relay boxes, etc., for a single track automatic signal installation. These signals will be installed between Piedmont, Mo., and Poplar Bluff, 39 miles.

THE NEW YORK CENTRAL has contracted with the Federal Signal Company for the installation of an electric interlocking plant at Utica, N. Y., with a machine of 180 levers. There will be 143 working levers for the control of 76 signals, 51 switches and 16 check locks. The signals will be Type 4. New York Central standards will govern throughout, including the use of concrete trunking and stakes.

THE CHICAGO GREAT WESTERN has ordered from the Federal Signal Company 133 Type 4A signals complete with all other materials required for automatic signals. The plans provide for route locking through several mechanical interlocking plants. These signals will be installed on this line from Jeff, Ia., to Alta Vista, 43 miles; from McIntire, Ia., to Bailey, 5 miles; from Taopi, Minn., to Dodge Center, 38 miles, and from Marshalltown, Ia., to Des Moines, 55 miles. This makes a total of 141 miles of road, single track.

Supply Trade News

Negotiations are reported under way for the purchase of the Pennsylvania Steel Company by the Bethlehem Steel Corporation.

The Q & C Company announces that it has discontinued, effective February 15, 1916, its representation of the Ross-Schofield system of circulation of water in locomotive boilers.

The Protective Signal Manufacturing Company of Denver, Colo., has acquired the manufacturing rights and exclusive sales privileges of the automatic flagman owned by the National Signal Company of San Francisco, Cal.

Albert W. Morse, at present associated with the E. & E. Products Company, Inc., 25 Broad street, New York, has also been elected vice-president of the Anthony Company, liquid fuel engineers, 138 West avenue, Long Island City, N. Y., succeeding Louis A. Sherman, who has severed his connection with the company.

J. A. & W. Bird & Co., Boston, Mass., have moved their New York office from 66 Beaver street to larger quarters in the Equitable building, 120 Broadway. The company announces that it has not advanced the price of Ripolin enamel paint; its stock being sufficiently large and the fact that the paint is manufactured in Holland permitting it to take care of practaically any demand.

Nine of the men who have been instrumental in upbuilding the H. W. Johns-Manville Company have been elected members of the board of directors. The nine are: L. R. Hoff, W. R. Seigle, T. T. Lyman, H. R. Trainer, Harry Gillett, Fred. B. Smith, J. E. Meek, H. R. Wardell and J. W. Perry. J. E. Meek, whose name is mentioned, is manager of the railroad department; he has been in the service of the company for 21 years and founded the department of which he is the head in 1906.

The first annual convention of the branch managers of the Trussed Concrete Steel Company, Detroit, Mich., was held during the week of January 25 to 28, at the company's main plant at Youngstown, Ohio. Representatives were in attendance from every section of the country, and from Japan, Hawaii, South America and Porto Rico. Business sessions were held each morning and afternoon at which officers of the company and heads of departments discussed various phases of the company's work and the others entered into the discussion.

The Dewey Cement Gun Company, recently organized, is an Illinois corporation, and has opened offices in the Chamber of Commerce building, Chicago. C. L. Dewey has been elected president, S. M. Hunter vice-president, and Herbert E. Bradley secretary and treasurer. The company is not a manufacturing or selling organization, but strictly an engineering and contracting firm specializing in coating structural steel viaducts and similar structures, waterproofing tunnels and reservoirs, coating steel coal bunkers, fireproofing timber construction, coating old and new masonry and concrete, coating metal lath of any description, and doing stucco work of all kinds.

Peter James Cunneen, manager of the Lassig plant of the American Bridge Company at Chicago, died, Sunday, February 13. Mr. Cunneen was born in Adrigoe, Ireland, June 21, 1859. He entered the employ of the old American Bridge Company in 1878 and remained in the service of that company and its various successors until the formation of the present American Bridge Company. For a while he was secretary of the Chicago Forge & Bolt Company, and later held a similar position with the American Bridge Works. After the formation of the American Bridge Company he served as purchasing agent, in charge of the Chicago district, and later became manager of the Lassig plant, at the time of his death having been in that position about 15 years.

R. L. Wilson manager of the railway division of the Westinghouse Electric & Manufacturing Company, has been appointed assistant general superintendent and as such will have direction

over trades' apprentices, employment, working conditions and matters of a similar nature. Mr. Wilson was born in Shelbyville, Ind., and is a graduate of Rose Polytechnic Institute of that state. He entered the employ of the Westinghouse Electric & Manufacturing Company in 1893 as a student draftsman, and subsequently became inspector, engineer of construction, and later superintendent of construction, at one time being in charge of erection work in the New York district. Later Mr. Wilson was made superintendent of the railway division, which position he continues to hold. He is chairman of the joint committee appointed by the company and the employees for the settlement of differences in opinion arising between the employees and the company, and is also trustee of the Veteran Employees' Association of the Westinghouse Electric Company.

The American Synthite Company, 30 Church street, New York, is now manufacturing and putting on the market a new chemical substance called Synthite. This is a synthetic or artificial gum and is furnished in the following forms: Synthite liquid insulating compound for insulating armatures, and coils, for transformer work and for such fine wire coils as are used in magnet, ignition and wireless telegraph work; Synthoid, a substitute for hard rubber; Synthite acid-proof, heat resisting compound or paint for wood and metal, railroad and marine equipment, electrical and chemical apparatus, containers for lime, chemicals, etc., and Synthite varnishes, lacquers and enamels. The substance has been developed and perfected after five years' work by Dr. Wallace Appleton Beatty, who after engaging in research work in chemistry at the University of Chicago, was research chemist for Colgate & Co. for nearly three years, and for two and one-half years with the Rockefeller Institute. The American Synthite Company was incorporated under the laws of New York last March. Its officers are John B. Given, trustee; H. M. Buck, president, and R. A. Paterson, vice-president and managing director. The works of the company are at Astoria, Long Island, N. Y.

Clarence L. Dewey, who with Herbert E. Bradley recently organized the Dewey Cement Gun Company of Chicago, was born at Dowagiac, Mich., on June 6, 1880, and was educated in the public schools there. In 1907 Mr. Dewey and Carl E. Akeley invented the cement gun for the purpose of coating the Field Museum of Natural History in Chicago, with gypsum in lieu of paint, which was out of question on account of the extensive brick and stucco surface to be covered. The result was so satisfactory that Mr. Akeley patented the cement gun, and organized a company to commercialize its use. For two years Mr. Dewey was stationed at the company's laboratory at Whitestone, Long Island, and carried on a series of experiments in working out the adaptability of the gun to various working conditions. When the machine was perfected, the General Cement Products Company was organized and the cement gun was put on the market under that name. In 1910, when the General Cement Gun Company of Chicago was incorporated, Mr. Dewey came to Chicago as superintendent of that company. The Cement Gun Construction Company was organized as a subsidiary for the purpose of doing the contracting work, and Mr. Dewey was placed in charge of this end of the business. In February, 1915, he disposed of his interests in this company and joined the Cement Gun Company, Inc., of New York, as chief engineer, and in that capacity went to Europe to introduce the gun—in France for the purpose of lining the trenches around cannon pits and officers' quarters with concrete, and in England to "overcoat" barracks built of concrete blocks.

C. L. Dewey

The T. George Stiles Company

The T. George Stiles Company, owned and operated by Mr. Stiles since 1901, and engaged in the manufacture of high grade signal apparatus, has been incorporated under the name of the T. George Stiles Company, with Mr. Stiles as president, and M. R. Briney, hitherto eastern manager of the General Railway Signal Company, as vice-president. The officers will have headquarters at 30 Church street, New York. The main offices and works are at Arlington, N. J.

Mr. Stiles, who is one of the old time signal men, has spent nearly his entire business career in the manufacturing, designing and installation of signal devices. He started with the Saxby & Farmer Company in 1877, and was later in the employ of the Stevens & Sons Company, and the Johnson Compensator Company. In 1888 he came to the United States, and for two years was in the service of the Johnson Signal Company, Rahway, N. J. He then returned to England to become outside superintendent for Dutton & Co., manufacturers of signal apparatus, and was also employed by them to reorganize their shops. In 1893 he returned to this country, and to the Johnson Signal Company, but when the firm went out of business in 1894, went to the Standard Signal Company, now the Federal Signal Company, remaining with it until 1901. For a while he was then employed by the Edison interests, and assisted in establishing a cost system. In the same year, 1901, he went into business for himself at Arlington, N. J., engaging in the manufacture of signal accessories.

M. R. Briney, who has been elected vice-president, resigned from his position as eastern manager of the General Railway Signal Company on January 1 to go with the T. George Stiles Company. Mr. Briney has spent his entire business life in the service of the Hall Switch & Signal Company, the Taylor Signal Company and the latter's successor, the General Railway Signal Company, with the exception of three years in the construction and maintenance departments of the Chicago & North Western, and three years as vice-president of the Bryant Zinc Company, New York.

It is the intention of the new company to follow along the lines hitherto pursued by Mr. Stiles.

Baldwin Locomotive Works

Although it was not until last August that the railway supply business began to show improvement, the gross sales of the Baldwin Locomotive Works for the year ended December 31, 1915, were nearly double those of 1915. They were, of course, not as great as the figures for 1913. The gross sales for the year just closed aggregated $22,083,011 as compared with $13,616,163 in 1914 and $37,630,969 in 1913. The company's sales showed a much greater increase than the cost of manufacture, for in 1915 the manufacturing profit was $2,400,000 greater than in 1914. The net profit was $2,827,816. In 1914 it was only $350,230, but in 1913 it totaled $4,017,800. The usual 7 per cent. dividends of $1,400,000 were paid on the preferred stock, but no dividends were paid on the common. The surplus on December 31, 1915, was $4,865,837, this amount being only $22,000 less than on December 31, 1913, despite the fact that the $1,800,000 paid in dividends in 1914 was nearly all paid out of surplus.

The Baldwin Locomotive Works has fared exceedingly well from the standpoint of foreign business. Last June it received an order for 250 locomotives from the Russian Government, completing this contract during September and October. It also did $2,743,077 worth of work on war supplies other than locomotives, although it has not attempted to manufacture complete ammunition. The report also says that:

"In addition to the contracts taken directly as above stated, arrangements have been made for the erection of new shops on the company's property at Eddystone, suitable for eventual use for the construction of locomotives, but which are meanwhile to be occupied under lease as follows:

"By the Remington Arms Company of Delaware, for the manufacture of rifles. This plant occupies about 34.5 acres, upon which buildings have been erected valued at $1,850,000.

"By the Eddystone Ammunition Corporation of New York, for the manufacture of shells. This plant occupies about 65 acres, upon which buildings have been erected valued at $1,600,000.

"Upon these contracts of lease to the two companies mentioned, the works will derive as a profit the return of the buildings leased, together with a further rental payment upon each rifle or shell manufactured, if these contracts are satisfactorily completed.

"As an essential part of the improvement of the Eddystone property, a pier is being built in the Delaware River, and the river is being dredged to a depth of twenty-six feet, at a cost including a crane and equipment, of about $250,000. This will permit of loading locomotives and other merchandise upon sea-going vessels directly from our own property."

A partial balance sheet follows:

ASSETS

Cost of plant and equipment		$37,295,863.30
Investments		4,422,006.04
Current assets:		
Inventories	$7,520,545.06	
Accounts receivable	6,873,802.95	
Bills receivable	1,387,159.00	
Marketable securities	1,934,715.15	
Cash	1,306,987.72	
		19,023,209.88
Deferred charges		275,927.30
		$61,017,006.52

LIABILITIES

Capital stock:		
Preferred	$20,000,000.00	
Common	20,000,000.00	
		$40,000,000.00
First mortgage bonds		10,000,000.00
Current liabilities:		
Accounts payable	$2,935,507.11	
Pay roll and salaries	172,714.85	
Bills payable	1,750,000.00	
Depositors' funds subject to notice	940,628.23	
Employees' Benefit Association	183,153.21	
		5,982,003.40
Accrued interest on bonds		83,334.00
Deferred credits		85,831.94
Surplus		4,865,837.18
		$61,017,006.52

TRADE PUBLICATIONS

PNEUMATIC TOOLS.—The Chicago Pneumatic Tool Company has recently issued Bulletin No. 34-K relative to the class N-SO fuel oil driven compressors and their application to the unit system of air power plants.

MACHINE TOOLS.—Bulletin No. 1013 recently issued by the Reliance Electric & Engineering Company, Cleveland, Ohio, gives a description and specifications of the Reliance type ASL, form A all-gear motor drive for application to cone-pulley lathes.

TRAM RAIL SYSTEMS.—The Brown Hoisting Machinery Company, Cleveland, Ohio, has issued a new catalogue describing the Brownhoist monorail system, and containing considerable data relative to the Brownhoist trolley and hand and electric hoists. It also contains many tables giving the dimensions of the various devices.

PLUMBING FIXTURES.—James C. Clow & Sons, Chicago, have issued a 52-page booklet entitled "Wasting a Million a Day," showing the large losses resulting from defective plumbing and describing in detail their plumbing fixtures for use in shops, stations and industrial plants. The book is attractively prepared and well illustrated throughout.

FREIGHT CARS.—The Ralston Steel Car Company, Columbus, Ohio, has recently issued a loose-leaf binder containing copies of bulletins showing cars which this company has built for various railroads and other owners of freight cars. Each bulletin illustrates one or more cars and gives a very brief description and general information relative to each car. The illustrations are extremely clear and the binder and its contents very attractively gotten up.

LOCOMOTIVE DEVICES.—The Franklin Railway Supply Company has recently issued an attractive and well illustrated booklet describing and illustrating in half-tones and line drawings the McLaughlin flexible conduit, Franklin ball joints and the Franklin single water joint. The McLaughlin flexible conduit is an all metal connection for use between engine and tender, etc., for air, steam and oil lines. When assembled it consists of two double joints, one single joint and two lengths of extra heavy wrought iron pipe. The Franklin ball joint is intended to replace rubber hose for use in round-houses or for heating coaches in terminals or coach yards. The single water joint is designed for injector connections.

Railway Construction

ARKANSAS & LOUISIANA MIDLAND.—Incorporated in Arkansas with $1,000,000 capital to build a railroad from Monroe, La., north via Monticello, Ark., and Crossett to Pine Bluff, about 140 miles. Edward Ford, president, New Orleans, La.; W. A. Otis, vice-president, and Alfred Cowle, secretary and treasurer.

CHICAGO, MILWAUKEE & ST. PAUL.—The extension of this road from Great Falls, Mont., northwest to Agawam, 70 miles, will be completed during the coming summer. All the grading was done in 1914, and three short girder bridges are nearly finished. Preparations are being made for track laying.

GREEN BAY & EASTERN.—A contract is reported let to the Western Engineering & Construction Company, Milwaukee, Wis., to build this interurban line. The projected route is from Green Bay, Wis., via Manitowoc to Sheboygan, about 72 miles. W. M. Willinger, president, and A. C. Lindelbach, chief engineer, Manitowoc. (January 7, p. 142.)

KANSAS CITY & TIFFANY SPRINGS.—A contract is reported let to Willard E. Winner, Kansas City, Mo., to build from Kansas City to Tiffany Springs, in Platte county, about 15 miles. The company was incorporated in Missouri in November, 1915, and the incorporators included T. N. Smith and C. W. Chandler, Kansas City, Mo.; H. G. Post, Kansas City, Kan., and R. Engelman, Parkville, Mo. (November 12, p. 922.)

KENTUCKY ROADS.—A logging railroad is being built from Johns Creek, Pike county, Ky., to McVeigh, in the same county, where a connection is to be made with the Norfolk & Western. Paris Charles, McVeigh, is carrying out the work.

MORRISBURG & OTTAWA ELECTRIC.—The Ontario legislature has been asked to extend the time in which to build this projected line from Morrisburg, Ont., northwest to Ottawa, about 50 miles. G. D. Kelley, Ottawa, is solicitor for the company.

NEW YORK SUBWAYS.—Bids were opened for the second time recently by the New York Public Service Commission, First district, for the installation of tracks on the White Plains road extension of the Lenox avenue branch of the existing subway. This extension is a three-track elevated railroad extending from One Hundred and Eightieth street north to Two Hundred and Forty-first street, near the northern city boundary. The Coast & Lakes Contracting Company, Inc., was the lowest bidder at $94,280. (February 4, p. 287.)

The commission opened bids also for the construction of Section No. 2-A of Route No. 12, a part of the Broadway-Fourth avenue subway in the borough of Brooklyn. Section No. 2-A lies in Flatbush avenue between Prospect Park plaza and the Brighton Beach line at Malbone street. The plans call for a two-track underground railroad. This is a part of the line which will connect the Fourth avenue subway with the Brighton Beach line. All the rest of the line is now under contract. The Degnon Contracting Company was the lowest bidder, at about $1,370,000. (January 28, p. 185.)

OIL BELT.—William Kenefick, of New York City, has purchased this road, and is contemplating extending it from Bridgeport, Ill., to Mt. Carmel, Ill., and from Bridgeport to Lawrenceville, Ill., and thence to Vincennes, Ind., Bruceville and Bicknell. When these extensions have been completed, 53 miles will have been added to the 25 miles of railroad now in operation between Oblong, Ill., and Bridgeport. The Oil Belt connects with the Illinois Central at Oblong, and with the Baltimore & Ohio Southwestern at Bridgeport. At Mt. Carmel it will connect with the Southern and the Cleveland, Cincinnati, Chicago & St. Louis; at Lawrenceville, with the Baltimore & Ohio Southwestern and the Big Four; at Vincennes, with the Vandalia, Big Four, Chicago & Eastern Illinois and the Baltimore & Ohio Southwestern; at Bruceville and Bicknell with the Vandalia. Charles J. Staples will be the receiver of the Oil Belt, and J. B. Campbell will continue in the position of general manager.

PROPOSED GOVERNMENT RAILWAY.—Edward T. Taylor has introduced a bill in Congress providing for the construction of a government railroad from Durango, Colo., to Gallup, New Mexico. The road is wanted to open up coal fields in that region.

TEXAS ROADS.—Plans are being made to build a line from Amarillo, Tex., north, it is said, to a point in Kansas, about 200 miles. W. L. Carwile, Fort Worth, is said to be interested.

WELLSBURG & EASTERN.—Incorporated in West Virginia with $5,000 capital, and headquarters at Wellsburg, W. Va. The company plans to build a railroad from Wellsburg, via Bethany to Dunssford, Pa. The incorporators include H. J. Arbenz, C. O. Schmidt, E. S. Romine and H. O. Wells, all of Wellsburg.

RAILWAY STRUCTURES

ALBANY, N. Y.—Bids are wanted until March 1 by Marcus T. Reynolds, architect, Albany, for building a new office building on the Plaza for the Delaware & Hudson. The proposed structure is to be four stories high, 50 ft. by 184 ft., of granite and steel construction, with concrete floors, and will cost about $260,000.

BUTTE, MONT.—The engineering department of the Chicago, Milwaukee & St. Paul has completed plans for a new $140,000 passenger terminal for the use of the St. Paul and the Butte, Anaconda & Pacific roads in this city. The structure will be of a modernized Spanish mission type, steel-frame building, faced with yellow brick and stone trimmings, covered with red-tile roofing, and resting on a concrete foundation. A 90-ft. clock tower, 20 ft. square at the base, will rise above the entrance, and a marquise will hang above the front and another over the side entrance. The main building will be about 146 ft. long by 41 ft. wide, with wings at each end to extend 24 ft. from the main structure towards the rear. A covered concourse 96 ft. by 50 ft. will adjoin the waiting room, and in turn will be situated at the end of the tracks and platforms, which will be covered with umbrella sheds 420 ft. long. A second floor to be built above the main waiting room will be utilized for office purposes, and there will be a one-story baggage and express building 194 ft. long. The building was designed and will be constructed under the supervision of C. F. Loweth, chief engineer. Plans were made in the office of H. C. Lothholz, engineer of design, and construction will be carried out under the immediate direction of F. B. Walker, assistant engineer.

CHARLESTON, ILL.—The State Public Utilities Commission of Illinois has ordered the Cleveland, Cincinnati, Chicago & St. Louis to build a concrete bridge west of the city.

CLARKSBURG, W. VA.—The Monongahela Valley Traction Company will open bids about April 1 for building a passenger and express station at Fourth street in Clarksburg. The proposed structure will be of reinforced concrete and brick constructions, three stories high, 70 ft. wide and 80 ft. long. The improvements will cost about $50,000.

CLARKS SUMMIT, PA.—The Delaware, Lackawanna & Western will build a bridge, for highway traffic, over its tracks in Clarks Summit. The work will be carried out by company forces.

HAMILTON, ONT.—The Board of Railway Commissioners of Canada has ordered the Toronto, Hamilton & Buffalo to build a new bridge to carry King street over its tracks in Hamilton.

NEW BERN, N. C.—The Norfolk Southern has given a contract to Rhodes & Underwood, New Bern, for putting up shops to replace the structures recently destroyed by fire at New Bern. (January 21, p. 148.)

PHILADELPHIA, PA.—Bids are wanted by the Pennsylvania Railroad for putting up a reinforced concrete freight and storage house on Washington avenue, in Philadelphia. The proposed building is to be four stories high with a cellar. It will be 60 ft. by 468 ft., and will cost about $250,000.

WATERLOO, IOWA.—The Illinois Central will soon begin the construction of an addition to its machine shops here. The extension will be 111 ft. long, and of the same width as the present building, i. e., 118 ft. The walls will be faced with brick, a composition roof will be supported by five truss spans, and a wooden block floor will be laid on a six-inch bed of concrete superimposed on a six-inch bed of cinders. The contract for the steel has been awarded to the American Bridge Company, and the general contract to T. S. Leake & Co. A new transfer table, an electric crane and miscellaneous tools and machinery will be installed in the shops. The total cost of the improvements has been estimated at about $110,000.

Railway Financial News

BOSTON & MAINE.—See an abstract of the statement given out by the board of directors, together with a minority opinion by Marcus P. Knowlton published elsewhere in this issue.

CHICAGO & NORTH WESTERN.—Kuhn, Loeb & Co. have bought $5,000,000 general mortgage 5 per cent bonds of the Chicago & North Western, due 1987. There are now a total of $76,381,000 bonds outstanding under this mortgage.

CHICAGO, ROCK ISLAND & PACIFIC.—A report has just been made by Harrington Emerson, employed by the independent stockholders' committee, which report estimates that it would be possible over a series of years to make the improvements which the Kendrick report makes out of earnings. The Emerson report estimates that only $176,637 need be spent in 1916-17 and that the remainder of the money, including the $26,488,000 for grade revision, new freight terminals, yards, etc., need not be made until after 1918, and only as net earnings justify these expenditures.

SHERMAN, SHREVEPORT & SOUTHERN.—Default was made on the interest due December 1, 1915, on the 50-year first mortgage 5 per cent bonds of this company, which is a subsidiary of the Missouri, Kansas & Texas. A committee has been formed with R. Walter Leigh, chairman, and the Columbia Trust Company, depositary, asking for the deposit of these bonds with the December 1 coupon attached.

TEXAS & PACIFIC.—A committee has been formed to represent the minority holders of the Texas & Pacific second mortgage income bonds, consisting of Mortimer N. Buckner, president of the New York Trust Company, chairman, and Owen F. Roberts and Edward Schaffer. Of the $25,000,000 second mortgage bonds outstanding, about $24,000,000 are held by the St. Louis, Iron Mountain & Southern.

WABASH.—A final distribution has been made of the proceeds of the sale of the collateral securing the $5,000,000 4½ per cent extended notes of the Wabash. This distribution included the cash received from the sale of Wabash-Pittsburg Terminal demand notes which were bought in by the reorganization committee of that company.

WABASH-PITTSBURG TERMINAL.—See Wabash.

WESTERN PACIFIC.—A press despatch from San Francisco says that $44,000,000 first mortgage bonds of the Western Pacific out of the total $50,000,000 outstanding have been deposited under the reorganization agreement.

RAILWAY EXTENSION IN BOLIVIA.—The Bolivian government is about to issue a call for tenders for the construction of a railroad from Potosi to Sucre. The new railway will be an extension of the present line to Potosi from Rio Mulato, which is on the Antofagasta & Bolivia Railway, making a total length of 215 miles on this branch line. The bids for construction, which must be presented before June 30, 1916, are to conform to detailed plans already formulated.

TRAINING RAILWAY APPRENTICES IN ITALY.—In Italy firemen are chosen from the ranks of the young mechanical workers, who have attended the ordinary elementary state schools. Candidates are admitted into the service only after having passed a competitive examination. They are given a special theoretical course by engineers, and receive practical training by working in the machine shops. Six to nine months are required to complete this course, after which each candidate must undergo further examination before he becomes a fireman. The working of air brakes is taught as an integral part of the course, the instruction relating not only to the working of the brakes, but giving also a full knowledge of the structure and functions of the parts. After at least four years' service as fireman the employee may take the final examination, which, if passed, entitles him to appointment as a locomotive engineer. The most efficient and intelligent among the engineers may be chosen as superintendents or chiefs of the locomotive sheds or shops.